U.S. DEPARTMENT OF COMMERCE/ National Oceanic and Atmospheric Administration





OFFICE OF THE FEDERAL COORDINATOR FOR
METEOROLOGICAL SERVICES AND SUPPORTING RESEARCH

AVIATION WEATHER PROGRAMS/PROJECTS 2004 UPDATE



Washington, DC December 2004

FCM-R21-2004

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Aviation Weather Programs/Projects 2004 Update

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Foreword

This report on aviation weather programs/projects updates the compilation of activities across Federal agencies that began with the *National Aviation Weather Initiatives Final Baseline Tier 3/4 Report*, distributed in 2001. In the time since the compilation effort began, we have largely achieved the objective of identifying in one document all or most of the federally supported research and development (R&D) efforts relevant to reducing weather-related risks to aviation. Many of these activities include industry, university, and association partners.

With this update, we have increased the focus on a second objective of our compilation effort: tracking progress toward completing the R&D phase and transferring the results—whether as specific technology products or as improved information products and services—into aviation operations. This update includes a tabulation by lead agency of programs/projects still under development and those which have moved into the operational phase. A new Highlights section notes some of the substantial achievements of the past year and major milestones toward operational implementation that are planned for fiscal year 2005 or 2006. As in the 2001 *Baseline* report and the 2003 update, details on upcoming milestones and planned operational use are included in Appendix A, which contains a fact sheet for each program/project in our database.

This report also updates and extends the analysis of trends in weather-related aviation accidents that first appeared in the *National Aviation Weather Program Mid-Course Assessment*, published in August 2003. Final data for 2002 from the National Transportation Safety Board have been used to update the trend analysis by aviation regulatory category and by categories of hazardous weather. For the most part, the positive trends identified and highlighted for attention in the *Mid-Course Assessment* are supported by the 2002 data. However, increases over the 2001 rates in fatal weather-related accidents and total weather-related accidents for our general aviation category remind us that the effort to deliver improved weather risk reduction products and services must be supported and sustained. Particularly essential is education and training for all general aviation pilots on how to deal with the deadliest weather-related hazards. Weather hazards will always be with those who fly; our goal must be to continually reduce the risks from encountering these hazards.

Samuel P. Williamson Federal Coordinator for Meteorological Services and Supporting Research

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Aviation Weather Programs/Projects 2004 Update

This report is the second update to the compilation of aviation weather programs and projects by the Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM). The first compilation was released in April 2001 as the *National Aviation Weather Initiatives Final Baseline Tier 3/4 Report*, with a first update released in December 2003 (OFCM 2001, 2003a). Appendix C explains the historical context for this compilation activity, which is conducted under the auspices of the National Aviation Weather Program Council. The second half of this introduction and Appendix D also update the *National Aviation Weather Program Mid-Course Assessment* (OFCM 2003b).

AVIATION WEATHER INITIATIVES AND SERVICE AREAS

National Aviation Weather Initiatives (OFCM 1999) defined the eight Service Areas and 86 initiatives used in OFCM reports on Aviation Weather Programs and Projects:

- Ceiling and Visibility (14 initiatives)
- Convective Hazards (12 initiatives)
- En Route Winds and Temperatures (7 initiatives)
- Ground De-Icing and Anti-Icing (6 initiatives)
- In-flight Icing (15 initiatives)
- Terminal Winds and Temperatures (11 initiatives)
- Turbulence (12 initiatives)
- Volcanic Ash and Other Airborne Hazardous Materials (9 initiatives).

As explained in Appendix C, a review of the service areas and initiatives by the participating agencies in 2003 resulted in no changes. Star headings (one to four stars) are applied to the initiatives to indicate the relative priority of initiatives in a service area. Initiatives assigned three or four stars are ranked by the participating agencies as higher in priority than initiatives with one or two stars. The review in 2003 reconfirmed the star rankings used in the *Baseline Tier 3/4 Report*.

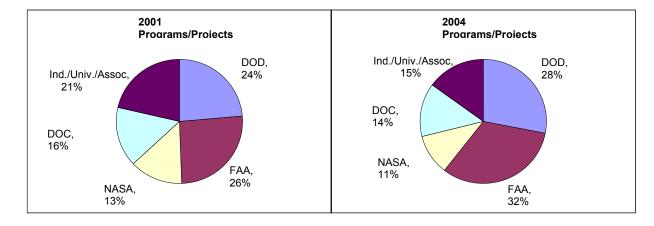
FACT SHEET COMPILATION, ANALYSIS, AND IMPLICATIONS

Fact sheets containing updated 2004 information for each aviation program and project are in Appendix A. Some programs/projects included in the 2003 update have since been terminated or redirected to meet new requirements. The fact sheets are used by the OFCM staff to match aviation weather programs/projects to the aviation weather initiatives. Not all of the programs/projects reported to OFCM match to an initiative, and the compilation effort does not include determining how well or completely the identified programs/projects are satisfying a particular initiative. Program work from only one agency toward an initiative does not necessarily imply insufficient effort on the initiative.

Multiple programs matched to an initiative do not necessarily imply duplication of effort. Initiatives being met by a program from only one agency may be viewed as opportunities for collaboration with other agencies to bring the work to completion. Initiatives being met with programs from multiple agencies may provide opportunities for pooling of resources and opportunities for collaboration.

The table below shows the counts of programs and projects identified this year (2004), compared with the counts in the *Baseline Tier 3/4 Report* (2001) and the 2003 update. As the pie charts illustrate, the identification of additional programs and projects between 2001 and 2003 primarily increased the proportion of *identified* programs/projects led by the Departments of Defense and Transportation. There was little change in numbers of identified aviation programs/projects during the past year. The FAA added programs for volcanic ash and flight level winds.

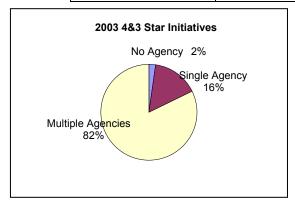
	Programs and Projects		
Lead Agency	2001	2003	2004
Department of Defense	21	40	39
Department of Transportation Federal Aviation			
Administration	23	43	45
National Aeronautics and Space Administration	12	15	15
Department of Commerce National Oceanic and Atmospheric Administration	14	19	19
Industry/University/			
Association Partners	19	23	21
TOTAL	89	140	139

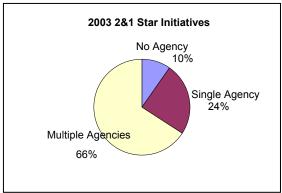


Match of Program/Projects to Initiatives

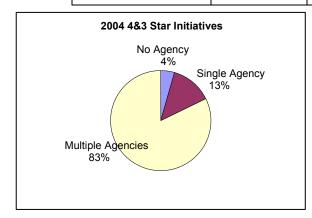
The match of programs/projects to initiatives has been reported since the *Baseline Tier 3/4 Report*. The following tables and graphs show that there was little change this year in the match of projects to four- and three-star initiatives and two- and one-start initiatives. The matrices showing the match of individual programs/projects to each initiative are in Appendix B.

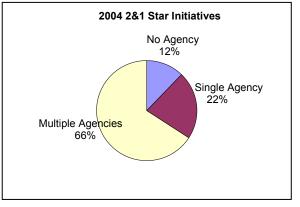
	4 & 3 Star	2 & 1 Star	
2003 Match	Initiatives	Initiatives	Total
No Agency	1	4	5
Single Agency	7	10	17
Multiple Agencies	37	27	64
TOTAL	45	41	86





	4 & 3 Star	2 & 1 Star	
2004 Match	Initiatives	Initiatives	Total
No Agency	2	5	7
Single Agency	6	9	15
Multiple Agencies	37	27	64
Total	45	41	86





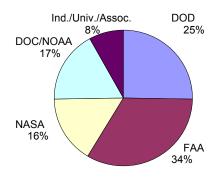
Operational/Completed Programs by Agency

The compilation of programs/projects is now in its fourth year. As one should expect, a number of those identified have been completed and their products are being transitioned to operations. The following table shows the number of programs/projects still in development and those that have been completed or otherwise transitioned to operations. The graphics show the distribution by lead agency of projects/programs still in development and of all projects/programs.

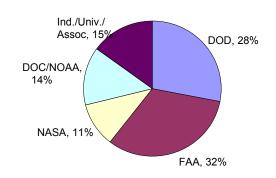
Developmental/Operational Status of Aviation Weather Programs/Projects

Lead Agency/Institution	Under Development	Completed or Operational	Total
Department of Defense	16	23	39
Department of Transportation Federal Aviation Administration	21	24	45
National Aeronautics and Space Administration	10	5	15
Department of Commerce National Oceanic and Atmospheric Administration	11	8	19
Industry, University, and Association Partners	5	16	21
TOTAL	63	76	139

Programs/Projects under Development



All Programs/Projects



HIGHLIGHTS OF RECENT RESULTS AND UPCOMING MILESTONES

When the OFCM began compiling a database of programs and projects that support the national aviation weather initiatives, a major objective was simply to identify and obtain current information about the many activities in progress, recently completed, or planned for initiation in the next year or two. Although additional new starts can be expected each year, it will become increasingly valuable to track completions, achievements, and most important, successful transitions of technology and program results into the operations of the aviation community. For this fiscal year (FY) 2004 update, the OFCM staff has selected some recent successes to highlight and some important upcoming milestones in moving products and results into operations.

This review is selective and partial, but it provides an informative cross section of what has happened during the past year in aviation weather research and what we can expect in the near future. The first mention of a program or project is in **boldface**. The corresponding fact sheet page in Appendix A is cited in square brackets after the name.

Federal Aviation Administration (FAA)

Among the many programs being led by the FAA in the Department of Transportation, the **Forecast Icing Potential** (FIP) product became operational in March 2004 [FAA-5A]. The FIP product is now available to the general aviation community, along with the **Current Icing Potential** (CIP) product, on the **Aviation Digital Data Service** (ADDS) website [FAA-5, FAA-4]. During the first quarter of FY 2005, a decision will be made on experimental use of the FIP Alaska product and on operational use of the higher-resolution 20 km CIP. (The CIP product first became operational in March 2002. The ADDS website became operational in September 2003.)

FAA's **Graphical Turbulence Guidance** (GTG) product for flight level 200 and higher (GTG FL200+) became operational in March 2003 for meteorologists and dispatchers [FAA-7]. An operational decision on the GTG product for FL 100-200 is scheduled for the first quarter of FY 2005. GTG FL210+ is available on the ADDS website. Readers of the *Mid-Course Assessment* report will recall that the GTG was highlighted as a key technology to reduce in-flight turbulence risks.

The **Terminal Convective Weather Forecast** (TCWF) product is an automated, one-hour graphical forecast of convection intended for use by FAA traffic managers in terminal areas with high traffic density [FAA-10]. It has now been successfully tested at Dallas/Ft. Worth, Orlando, New York, and Memphis airports. In FY 2006, TCWF will be installed at operational Integrated Terminal Weather System (ITWS) sites. The **Terminal Ceiling and Visibility** (TCV) product, which provides automated forecasts for airports with chronic low ceiling and visibility risks, had its test bed trial in New York City airports in FY 2004 [FAA-36].

The **Water Vapor Sensing System** (WVSS) is a sensor system that automatically makes in situ water vapor observations from commercial aircraft on which it is installed and downlinks the data for use by weather forecasters [FAA-12]. The WVSS became

operational in May 2004, and transfer of the technology to NOAA is scheduled to be completed in FY 2005.

National Aeronautics and Space Administration (NASA)

During the first quarter of FY 2004, NASA's **Synthetic Vision System** (SVS) had its initial flight evaluation for air transport [NASA-6]. For this evaluation, SVS display concepts were integrated with concepts to prevent runway incursions. During FY 2005, the **Terminal Prediction and Warning Systems (TPAWS)** project will be undertaking in-service evaluations of its Enhanced Turbulence Radar and the **Turbulence AutoPIREPS System** (TAPS) [NASA-7].

In NASA's **Weather Information Communications** [WINCOMM] project, the next-generation weather datalink technology had its initial lab evaluation during the fourth quarter of FY 2004 [NASA-8]. A flight evaluation of this datalink technology is scheduled for the third quarter of FY 2005.

National Oceanic and Atmospheric Administration (NOAA)

The **Weather Research and Forecasting** (WRF) mesoscale modeling activity is a consortium effort led by NOAA with support from other agencies and academia [NOAA-9]. WRF models continue to move into operational use in various applications, some of which have direct and significant impact on improving aviation forecasts. During 2004, a WRF version became operational at NOAA's National Centers for Environmental Prediction (NCEP) and the Forecast Systems Laboratory. A WRF model will become operational at the Air Force Weather Agency in FY 2005. Implementation of a WRF model in the NCEP High Resolution Window began in October 2004.

Integrated Radar Data Services (IRaDS) began operations in August 2004 [NOAA-10]. IRaDS is a collaborative effort to concentrate and transmit high-resolution weather radar data at cost for use by the private sector, government agencies, and researchers.

Development of the **Prototype Aviation Collaborative Effort** (PACE) will continue with additional evaluations in the spring of 2005 for the Tactical Convective Hazard Product and Crosswind Tactical Decision Aid [NOAA-12]. The plan for this suite of products tailored for the needs of an Air Route Traffic Control Center includes icing, turbulence, and ceiling and visibility products.

As emphasized in Section 4 of the *Mid-Course Assessment*, NOAA is collaborating with the aviation community on weather training for general aviation pilots. The weather-related accident data for general aviation, discussed in the next section, underscore the importance of these efforts for reducing weather-related accidents. The **Pilot Training Initiative** (PTI), a collaboration with the Aircraft Owners and Pilots Association (AOPA) Air Safety Foundation and Meteorologix, will provide live seminars nationwide in most U.S. cities during FY 2005 [NOAA-13]. The PTI targets the general aviation community

and Certified Flight Instructors. Another important part of the overall education and training for technology transfer, NOAA's **Aviation Operations Course** for National Weather Service aviation forecasters, became operational in November 2004.

WEATHER HAZARD ACCIDENT TRENDS

The following discussion of trends in weather-related accidents extends the analysis presented in the *National Aviation Weather Program Mid-Course Assessment* (OFCM 2003b) with the final NTSB data for accidents that occurred in 2002. Preliminary NTSB data for 2003 are considered in some of the discussion about weather factors within a weather hazard category. However, the 2003 data are still too preliminary to use in calculating accident trends by the least squares regression method defined in the *Mid-Course Assessment*. Appendix C explains how the 80 percent reduction goals for 2006 originated. Appendix D contains the tabulated data and a set of graphs, comparable to those used in the *Mid-Course Assessment*.

Appendix C includes descriptions of the three aviation regulatory categories used by the NTSB and the FAA and adopted as well for the *Mid-Course Assessment*. Stated broadly, flights of aircraft capable of carrying 10 or more passengers by a common carrier (that is, a commercial airline) are regulated under Part 121 of the Federal Aviation Regulations. Part 91 covers all noncommercial and nonmilitary aviation. Revenue-generating flights not covered under Part 121, including scheduled passenger service in aircraft with fewer than 10 seats and nonscheduled passenger and cargo service, are covered by Part 135.

Part 91, General Aviation

The fatal accident rates for Part 91 accidents from all causes and for weather-related accidents increased in 2002 relative to 2001. However, the trend since 1996 for weather-related fatal accidents still achieves the 2006 goal of 0.08 or fewer accidents per 100,000 flight hours. The total weather-related accident rate also increased to the highest level (1.35 per 100,000 flight hours) since the 1998 rate of 1.43 per 100,000 flight hours.

- When the data are analyzed by weather hazard categories, the 2002 rates continued on a downward trend for precipitation (non-icing hazards)
- For the following categories, 2002 rates are higher than in 2001, but a satisfactory downward trend (achieving an 80 percent reduction by 2006) is still intact:
 - -- Restricted visibility and ceiling hazards
 - -- Icing hazards (particularly strong increase in 2002 over recent years)
 - -- En route and terminal winds.
- For **turbulence and convection** hazards, a small increase in *fatal* accidents leaves the trend on track to meet the 2006 goal. However, a larger relative increase for *total* accidents with turbulence or convection hazards cited as a factor has shifted that trend above its 2006 goal (0.29 versus 0.15 accidents per 100,000 flight hours).

• For **temperature and lift hazards**, there were increases in 2002 much above the previous trend for both fatal and total weather-related accident rates. Neither trend would now meet an 80% reduction goal by 2006. The increases in both total and fatal accidents were entirely due to *high density altitude*, a hazard that was called out for attention in the *Mid-Course Assessment*.

The 2003 Nall Report on accident trends and factors in the general aviation community, prepared and published by the AOPA Air Safety Foundation, found that visual flight rule (VFR) flight into instrument meteorological conditions (IMC) resulted in the greatest number of fatal weather accidents for the general aviation categories it covers (Air Safety Foundation 2004). In the Appendix D analyses for Part 91, the Restricted Visibility and Ceiling Hazards category illustrates this problem. Of 67 total weather-related accidents, 50 involved fatalities (75 percent), by far the highest percentage among the categories analyzed. These 50 fatalities represent 68 percent of the weather-related fatalities in all of Part 91. The hazard categories of Precipitation, Icing Conditions, and Temperature and Lift Hazards also had relatively high proportions of fatal accidents. For these weather-related factors, pilot education and training can make a major difference in how the general aviation pilot responds to the hazard.

Part 121, Larger Commercial Carriers

Again in 2002, there were no fatal weather-related accidents involving Part 121 aircraft. The rate per 100,000 departures for all weather-related accidents continued to decrease. As was highlighted in the *Mid-Course Assessment*, **turbulence and convection hazards** continue to dominate the weather hazards cited in Part 121 accidents. Of the nine weather-related accidents in 2002 involving Part 121 aircraft, seven involved turbulence and convection hazards. In the preliminary data for 2003, 11 of 12 weather-related accidents are in this category.

Part 135, Small Scheduled Passenger Service and Nonscheduled Commercial Flights

The total weather-related accident rate for Part 135 aviation decreased in 2002, shifting the trend from an upward to a downward slope. The fatal accident rate and the trend were little changed from last year's analysis in the *Mid-Course Assessment*.

The hazard category trends observed in the *Mid-Course Assessment* continued with little change for:

- Restricted visibility and ceiling hazards
- Precipitation (non-icing) hazards

¹ The annual Nall Report uses NTSB data on aviation accidents during the preceding year. The definition of general aviation aircraft used in the Nall Reports overlaps substantially, but is not identical to, the definition used in this report, which covers flights regulated under 14 CFR 91 (see Appendix C). Nevertheless, the detailed analysis of the accident data performed by the Air Safety Foundation staff provides valuable insights into the statistical trends seen in the NTSB data for weather-related accidents.

- Icing conditions
- Turbulence and convective hazards
- En route and terminal winds.

For *temperature and lift hazards*, a second year in a row with no accidents has shifted the trend from an upward to a downward slope. If this trend is sustained, the projected 2006 fatal accident rate will achieve the 80 percent reduction goal for this hazard category.

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Appendix A-1 Federal Aviation Administration (FAA)

FAA-1	WSP	Weather Systems Processor
FAA-2	MIAWS	Medium Intensity Airport Weather System
FAA-3	TDWR	Terminal Doppler Weather Radar
FAA-4	ADDS	Aviation Digital Data Service
FAA-5	CIP	Current Icing Potential
FAA-5A	FIP	Forecast Icing Potential
FAA-6	ITA	In-Situ Turbulence Algorithm
FAA-7	GTG	Graphical Turbulence Guidance
FAA-8	NCWF	National Convective Weather Forecast
FAA-9	MSFS	Maritime Stratus Forecast System
FAA-10	TCWF	Terminal Convective Weather Forecast
FAA-11	WSDDM	Weather Support to Ground De-Icing Decision Making
FAA-12	WVSS	Water Vapor Sensing System
FAA-13	FISDL	Flight Information Services Data Link
FAA-14	MDCRS	Meteorological Data Collection and Reporting System
FAA-15	ITWS	Integrated Terminal Weather System
FAA-16	WARP	Weather and Radar Processor
FAA-17	CDMNeT	Collaborative Decision Making Network
FAA-18	WMSCR	Weather Message Switching Center Replacement
FAA-19	OASIS	Operational and Supportability Implementation System
FAA-20	OCTH	Oceanic Cloud Top Height Product
FAA-21	OCD	Oceanic Convective Diagnosis Product
FAA-22	OCN	Oceanic Convective Nowcast Product
FAA-23	TFO	Turbulence Forecast, Oceanic
FAA-24	VACT	Volcanic Ash Coordination Tool
FAA-25	AWOS/ASOS	Automated Weather Observing System/Automated Surface
		Observing System
FAA-26	LLWAS	Low Level Wind Shear Alert System
FAA-27	RUC	Rapid Update Cycle Model
FAA-28	ADAS	AWOS Data Acquisition System
FAA-29	RCWF	Regional Convective Weather Forecast Product
FAA-30	SBID	Satellite-Based Icing Detection Product
FAA-31	GRIDS	Ground-Based Remote Icing Detection System
FAA-32	CIWS	Corridor Integrated Weather System
FAA-33	RTDA	Radar Turbulence Detection Algorithm
FAA-34	RVR	Runway Visual Range
FAA-35	NCV	National Ceiling and Visibility Product
FAA-36	TCV	Terminal Ceiling and Visibility Product
FAA-37	JAWS	Juneau Airport Wind System
FAA-38	PA	Polarization Algorithm
FAA-39	CA	Circulation Algorithm
FAA-40	MRC	Multi-Radar Composites
FAA-41	SF-21	Safe Flight 21
FAA-42	SAWS	Stand Alone Weather Sensors
FAA-43	VA	Volcanic Ash Product
FAA-44	FLW	Flight Level Winds

Weather Systems Processor (WSP)

PROGRAM/PROJECT: Terminal Business Service

LEAD AGENCY: Federal Aviation Administration (FAA)

LEAD AGENCY POC: Dan Kinder, FAA-ATB-400, 202-267-7198, dan.kinder@faa.gov

PROGRAM POC: Dan Strawbridge, FAA/ATO-T-SSE, 202-385-8671, dan.strawbridge@faa.gov

SERVICE AREA/INITIATIVE

• National Aviation Weather Initiatives:

2: 5 **6:** 8

FUNDING

• Programmed/Planned (\$'s/FY): /FY04 /FY05

TYPE OF PROGRAM/APPLICATION

Acquisition/Decision Support

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: a modification to the existing airport surveillance radar (ASR-9) adding a processor to detect hazardous weather conditions in the terminal area. The WSP is being fielded at 34 non-Terminal Doppler Weather Radar (TDWR) airports.
- How operations will be changed/improved: better detection of hazardous wind shear and microburst events near airport runways. The unit will also detect and predict the arrival of gust fronts and storm cells. This improved capability will enhance both air traffic safety and efficiency.

PROGRAM/PROJECT MANAGEMENT

- *Basic guidance document for this program:* Federal Acquisition Management System Program/Project Management Plan for the Weather Systems Processor.
- **Program's verification process:** The WSP has been subjected to all of the normally required programmatic reviews, from development of the specification and statement of work to operational test and evaluation. The system was developed through a prototype development process for many years. During this developmental time, input from the operational users in the field was constantly evaluated and then incorporated into the system design.
- *Method used for end product validation:* As part of the National Aerospace System, the WSP will be routinely certified by FAA technicians.
- Operational training for the user: Training has been developed for WSP by the FAA Academy and is delivered on site by Academy instructors in a formal classroom environment.

- Next major program milestone: All systems commissioned by end of FY 04.
- *Program becomes operational:* WSP is an operational system.
- Plans for further improvements: N/A

Medium Intensity Airport Weather System (MIAWS)

PROGRAM/PROJECT: Terminal Business Service

LEAD AGENCY: Federal Aviation Administration (FAA)

LEAD AGENCY POC: Diane Pino, FAA-ATO-T, 202-385-8593, diane.pino@faa.gov

PROGRAM POC: Dan Strawbridge, FAA/ATO-T-SSE, 202-385-8671, dan.strawbridge@faa.gov

SERVICE AREA/INITIATIVE

• National Aviation Weather Initiatives:

FUNDING

Programmed/Planned (\$'s/FY): /FY05 FY/06 /FY07

TYPE OF PROGRAM/APPLICATION

Acquisition/Decision Support

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: a weather processing system that incorporates new weather algorithms, human interfaces, and available NEXRAD data to provide precipitation intensity, storm motion, and storm motion predictions for smaller airports. The Medium Intensity Airport Weather System (MIAWS) is planned for installation at 40 Low Level Wind Shear Alert System (LLWAS) sites. MIAWS will be used at airports which will not receive either the Terminal Doppler Weather Radar or the Weather Systems Processor.
- How operations will be changed/improved: Provides accurate/timely storm intensity information without the need for interpretation or intensive training. The availability of this information will enhance the safety of operations, especially when used in conjunction with wind shear and microburst information available from the LLWAS.

PROGRAM/PROJECT MANAGEMENT

- *Basic guidance document for this program:* Federal Acquisition Management System Program/Project Management Plan for the Medium Intensity Airport Weather System.
- *Program's verification process:* This program is being prototyped at MIT Lincoln Laboratory's Memphis facility in order to use the Integrated Terminal Weather System (ITWS) installed there. This provides a real time, "truth" type comparison of its output. Prototypes have also been installed at the Jackson, MS, Springfield, MO, and Little Rock AR airports, and are currently in use under the authority of a NAS change proposal.
- *Method used for end product validation:* As discussed above, the end product (storm intensity and motion) has been compared to the ITWS. The results of this comparison indicated that the MIAWS performance was as expected and was of a high enough quality to proceed to the prototype installation at the Jackson, MS airport.
- Operational training for the user: The training for users at Jackson, MS was provided by MIT/LL personnel.
 Training format and content for operational personnel, should the system be fielded, has not yet been determined.

SCHEDULE/IMPLEMENTATION

• Next major program milestone: TBD

Program becomes operational: TBD

• Plans for further improvements: TBD

Terminal Doppler Weather Radar (TDWR)

PROGRAM/PROJECT: Terminal Business Service

LEAD AGENCY: Federal Aviation Administration (FAA)

LEAD AGENCY POC: Dan Kinder, FAA-ATB-400, 202-267-7198, dan.kinder@faa.gov

PROGRAM POC: Dan Strawbridge, FAA/ATO-T-SSE, 202-385-8671, dan.strawbridge@faa.gov

SERVICE AREA/INITIATIVE

• National Aviation Weather Initiatives:

2: 5 **6:** 8

FUNDING

• Programmed/Planned (\$'s/FY): /FY04 /FY05

TYPE OF PROGRAM/APPLICATION

Acquisition/Decision Support

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: doppler weather radar for installation at 45 high activity airports.
- How operations will be changed/improved: better detection of wind parameters indicating convective microbursts, gust fronts, and wind shifts and the capability to disseminate radar derived, real-time, wind warnings and advisories.

PROGRAM/PROJECT MANAGEMENT

- *Basic guidance document for this program:* Federal Acquisition Management System Program/Project Management Plan for the Terminal Doppler Weather Radar
- *Program's verification process:* This program complied with all applicable agency requirements during design, acquisition, and implementation.
- Method used for end product validation: This system is routinely certified by FAA technicians.
- *Operational training for the user:* Training is delivered to site personnel, at the site training facility, by FAA Academy instructors in a classroom environment.

- Next major program milestone: N/A
- **Program becomes operational:** TDWR is an operational system.
- *Plans for further improvements:* A Service Life Extension Program (SLEP) is currently being implemented. This SLEP will significantly extend the useful life of the system.

Aviation Digital Data Service (ADDS)

PROGRAM/PROJECT: Aviation Weather Research Program/Aviation Forecasts Product Development Team [http://adds.aviationweather.gov]

<u>LEAD AGENCY/COLLABORATING AGENCIES</u>: Federal Aviation Administration (FAA), National Oceanic and Atmospheric Administration (NOAA) and the National Center for Atmospheric Research (NCAR)

<u>LEAD AGENCY POINT OF CONTACT</u>: Gloria Kulesa, FAA/AWRP, 202-267-7289, Gloria.kulesa@faa.gov

<u>PROGRAM POINT OF CONTACT</u>: Lynn Sherretz, NOAA (FSL), 303-497-5580, lynn.sherretz@noaa.gov

SERVICE AREA(S)/INITIATIVE(S)

National Aviation Weather Initiatives:
1: 1 2: 1 3: 1 5: 1 7: 2

FUNDING

Programmed/Planned (\$'s/FY): /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: an internet (web based) weather information service. ADDS is a
 digital database that enables aviation end-users, including airlines, general aviation, and dispatchers, to acquire
 automated aviation weather information for hazards such as icing, turbulence and convection. The ADDS Flight
 Path Tool provides horizontal depictions as well as vertical cross sections of aviation weather hazards along user
 specified flight paths.
- How operations will be changed/improved: enables aviation end-users to acquire aviation weather warnings
 and forecasts, observations, and a variety of alphanumeric and graphical products via the internet. ADDS
 helps reduce delays and enhance safety and efficiency of the National Airspace System by increasing the shared
 situational awareness among aviation decision makers through accurate and timely graphical weather
 information.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Aviation Forecasts Product Development Team Technical Direction and Seven Year Plan.
- Program/Project verification process: Monthly and Quarterly Reporting, Program Reviews, Research, Engineering and Development Advisory Committee assessments.
- Method used for end product validation: Real Time Verification System (RTVS) and real-time user feedback.
- *Operational training for the user:* Training tutorials for the Flight Path Tool as well as other products can be found on the ADDS web site; http://adds.aviationweather.gov.

- Next major program milestone: N/A
- Program becomes operational: ADDS became operational at the Aviation Weather Center on Sept 30, 2003.
- *Plans for further improvements:* Improve and upgrade operational and experimental ADDS with new products, improved data delivery mechanisms, and advanced interface and display capabilities.

Current Icing Potential (CIP)

PROGRAM/PROJECT: Aviation Weather Research Program/ In-Flight Icing Product Development Team [http://www.faa.gov/aua/awr/]

LEAD AGENCY/COLLABORATING AGENCIES: Federal Aviation Administration (FAA)/National Center for Atmospheric Research (NCAR) and National Oceanic and Atmospheric Administration (NOAA) **LEAD AGENCY POINT OF CONTACT:** Gloria Kulesa, FAA/AWRP, 202-267-7289, gloria.kulesa@faa.gov **PROGRAM POINT OF CONTACT:** Marcia Politovich, NCAR, 303-497-8449, marcia@ucar.edu

SERVICE AREA(S)/INITIATIVE(S)

National Aviation Weather Initiatives:
5: 1.11

FUNDING

• Programmed/Planned (\$'s/FY): /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: an automated product graphically displaying current diagnosis of icing potential using information from several sources including satellite imagery, the Rapid Update Cycle (RUC) model, surface observations, NEXRAD data, and pilot reports.
- How operations will be changed/improved: integration of operational model output with real-time sensor data will produce improved automated in-flight icing products such as depictions of in-flight icing potential with higher vertical and horizontal resolution.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: In-Flight Icing Product Development Team Technical Direction and Seven Year Plan.
- **Program/Project verification process:** Monthly and quarterly reporting; program reviews; Research, Engineering, and Development Advisory Committee program assessments; science panel reviews; use of test beds for demonstrations and evaluations; Aviation Weather Technology Transfer Board decisions; and technical/human factors/user assessments.
- Method used for end product validation: The Real-Time Verification System (RTVS).
- *Operational training for the user:* Hands-on training provided for Aviation Weather Center forecasters. Online information available via the ADDS web site; http://adds.aviationweather.gov.

- *Next major program milestone:* 1QFY05 operational decision for the 20km CIP.
- Program becomes operational: CIP went operational on March 27, 2002.
- *Plans for further improvements:* FY06 operational decision to add icing severity to CIP.

Forecast Icing Potential (FIP)

PROGRAM/PROJECT: Aviation Weather Research Program/ In-Flight Icing Product Development Team [http://www.faa.gov/aua/awr/]

<u>LEAD AGENCY/COLLABORATING AGENCIES</u>: Federal Aviation Administration (FAA)/ National Center for Atmospheric Research (NCAR) and National Oceanic and Atmospheric Administration (NOAA)

<u>LEAD AGENCY POINT OF CONTACT</u>: Gloria Kulesa, FAA/AWRP, 202-267-7289, gloria.kulesa@faa.gov **PROGRAM POINT OF CONTACT**: Marcia Politovich, NCAR, 303-497-8449, marcia@ucar.edu

SERVICE AREA(S)/INITIATIVE(S)

National Aviation Weather Initiatives:
5: 1, 8, 10

FUNDING:

Programmed/Planned (\$'s/FY): /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: an automated, graphical product of forecast icing potential out to 12 hours using information from the Rapid Update Cycle (RUC) model.
- How operations will be changed/improved: integration of operational model output with real-time sensor data will produce improved automated in-flight icing products such as forecasts of in-flight icing potential with higher vertical and horizontal resolution.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: In-Flight Icing Product Development Team Technical Direction and Seven Year Plan.
- *Program/Project verification process:* Monthly and quarterly reporting; program reviews; Research, Engineering, and Development Advisory Committee program assessments; science panel reviews; use of test beds for demonstrations and evaluations; Aviation Weather Technology Transfer Board decisions; and technical/human factors/user assessments.
- *Method used for end product validation:* Verification of product improvements via the real-time verification system.
- *Operational training for the user:* Hands-on training provided for Aviation Weather Center (AWC) forecasters. On-line information available via the ADDS web site; http://adds.aviationweather.gov.

- Next major program milestone: 1QFY05- experimental decision for the FIP Alaska product.
- *Program becomes operational:* The FIP product became operational in March 2004.
- *Plans for further improvements:* FY07- add supercooled large drop (SLD) capability. FY08- add icing severity.

In-Situ Turbulence Algorithm (ITA)

PROGRAM.PROJECT: Aviation Weather Research Program/Turbulence Product Development Team [http://www.faa.gov/aua/awr/]

LEAD AGENCY/COLLABORATING AGENCIES: Federal Aviation Administration (FAA)/National Center for Atmospheric Research (NCAR)

<u>LEAD AGENCY POINT OF CONTACT</u>: Gloria Kulesa, FAA/AWRP, 202-267-7289, gloria.kulesa@faa.gov **PROGRAM POINT OF CONTACT**: Bob Sharman, NCAR, 303-497-8457, sharman@ucar.edu

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: 2: 4 7: 1.5

FUNDING

• *Programmed/Planned (\$'s/FY):* /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: a software package to enable commercial aircraft to automatically measure (quantitatively) turbulence and automatically downlink the information in real time.
- How operations will be changed/improved: improved accuracy of turbulence observations will improve the forecasting of turbulence and help reduce injuries associated with turbulence encounters.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Turbulence Product Development Team Technical Direction and Seven Year Plan.
- *Program/Project verification process:* Monthly and quarterly reporting; program reviews; Research, Engineering, and Development Advisory Committee program assessments; science panel reviews; use of test beds for demonstrations and evaluations.
- Method used for end product validation: Algorithm tuning, flight simulator testing, and flight testing.
- Operational training for the user: Hands on training is provided for Aviation Weather Center forecasters.

- Next major program milestone: Implement the algorithm on 172 commercial aircraft by end of FY05.
- *Program becomes operational:* The capability to down link turbulence information is currently operational.
- *Plans for further improvements:* Continue the implementation and validation of the in-situ turbulence algorithm on airline partner commercial aircraft, including United Airlines, Northwest Airlines, American Airlines, Southwest Airlines, and Delta Airlines.

Graphical Turbulence Guidance (GTG)

PROGRAM.PROJECT: Aviation Weather Research Program/Turbulence Product Development Team [http://www.faa.gov/aua/awr/]

<u>LEAD AGENCY/COLLABORATING AGENCIES</u>: Federal Aviation Administration (FAA)/National Center for Atmospheric Research (NCAR) and National Oceanic and Atmospheric Administration (NOAA) Forecast Systems Laboratory (FSL)

LEAD AGENCY POINT OF CONTACT: Gloria Kulesa, FAA/AWRP, 202-267-7289, gloria.kulesa@faa.gov **PROGRAM POINT OF CONTACT:** Bob Sharman, NCAR, 303-497-8457, sharman@ucar.edu

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: 7: 10

FUNDING

• Programmed/Planned (\$'s/FY): /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: the capability to combine model output, in-situ measurements, and pilot reports within an artificial intelligence system to produce an automated, graphical forecast of upper level jet stream/frontal clear air turbulence that is supplemental AIRMETs and SIGMETs.
- How operations will be changed/improved: allow aircraft to avoid areas of turbulence and therefore reduce injuries caused by unexpected encounters with turbulence.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Turbulence Product Development Team Technical Direction and Seven Year Plan.
- **Program/Project verification process:** Monthly and quarterly reporting; program reviews; Research, Engineering, and Development Advisory Committee program assessments; science panel reviews; use of test beds for demonstrations and evaluations; Aviation Weather Technology Transfer Board decisions; and technical/human factors/user assessments.
- *Method used for end product validation:* Verification of product improvements via the real-time verification system.
- *Operational training for the user:* Hands-on training is provided to Aviation Weather Center Forecasters. Information on GTG available on ADDS web site; http://adds.aviationweather.gov.

- Next major program milestone: 1QFY06 operational decision for GTG FL100-200.
- Program becomes operational: GTG FL200+ became operational in March 2003 for meteorologists and dispatchers.
- *Plans for further improvements:* Continuing research will add other operational turbulence features, such as mountain wave turbulence (FY08) and convectively induced turbulence (FY10).

National Convective Weather Forecast (NCWF)

PROGRAM.PROJECT: Aviation Weather Research Program/Convective Weather Product Development Team, [http://www.faa.gov/aua/awr/]

LEAD AGENCY/COLLABORATING AGENCIES: Federal Aviation Administration (FAA), the National Center for Atmospheric Research (NCAR), and MIT/LL

LEAD AGENCY POINT OF CONTACT: Gloria Kulesa, FAA/AWRP, 202-267-7289, gloria.kulesa@faa.gov **PROGRAM POINT OF CONTACT:** Cindy Mueller, NCAR, 303-497-8485, mueller@ncar.edu; Marilyn Wolfson, MIT LL, 781-981-3409, mwolfson@ll.mit.edu

SERVICE AREA(S)/INITIATIVE(S)

National Aviation Weather Initiatives:2: 10, 11

FUNDING

• *Programmed/Planned (\$'s/FY):* /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: 0-6 hr automated, graphical, conus-scale convective weather forecast product including thunderstorm initiation, growth, and decay (2 hour forecast using expert systems; 6 hour forecast using model output).
- How operations will be changed/improved: will supplement the Aviation Weather Center's Convective SIGMET program and will improve forecasts of convective activity resulting in a safer and more efficient National Air Space System.

PROGRAM/PROJECT MANAGEMENT

- *Basic guidance document for this program:* FAA Convective Weather Product Development Team Technical Direction and Seven Year Plan.
- Program/Project verification process: Monthly and quarterly reporting; program reviews; Research,
 Engineering, and Development Advisory Committee program assessments; science panel reviews; use of test
 beds for demonstrations and evaluations; Aviation Weather Technology Transfer Board decisions; and
 technical/human factors/user assessments.
- *Method used for end product validation:* Verification of product improvements via the real time verification system.
- *Operational training for the user*: Hands-on training provided for aviation weather center forecasters. On-line information available via the ADDS web site; http://adds.aviationweather.gov.

- Next major program milestone: FY05- decision to begin testing the echo tops enhancement.
- *Program becomes operational:* The 1-hr NCWF became operational in September 2001.
- *Plans for further improvements:* An operational 2-hour product in FY07, echo tops in FY10, and an operational 6-hr product in FY11.

Marine Stratus Forecast System (MSFS)

PROGRAM/PROJECT: Aviation Weather Research Program/Terminal Ceiling & Visibility Product Development Team [http://www.faa.gov/aua/awr/]

LEAD AGENCY/COLLABORATING AGENCIES: Federal Aviation Administration (FAA)/Massachusetts Institute of Technology, Lincoln Laboratory (MIT/LL), National Center for Atmospheric Research (NCAR) **LEAD AGENCY POINT OF CONTACT:** Gloria Kulesa, FAA/AWRP, 202-267-7289, gloria.kulesa@faa.gov **PROGRAM POINT OF CONTACT:** Dave Clark, MIT/LL, 781-981-3684, davec@ll.mit.edu

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: 1: 11

FUNDING

• Programmed/Planned (\$'s/FY): /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION

R&D/Decision Support

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: a 1-6 hour automated, graphical consensus forecast of the marine stratus burn-off for the San Francisco International Airport using improved sensing of key atmospheric parameters, dynamic atmospheric modeling, and forecasting rules.
- How operations will be changed/improved: allows for real time planning of the resumption of parallel aircraft approaches to maximize capacity.

PROGRAM/PROJECT MANAGEMENT

- *Basic guidance document for this program:* Terminal Ceiling and Visibility Product Development Team Technical Direction.
- *Program/Project verification process:* Monthly and quarterly reporting; program reviews; Research, Engineering, and Development Advisory Committee program assessments; science panel reviews; use of test beds for demonstrations and evaluations; and technical/human factors/user assessments.
- *Method used for end product validation:* evaluation by Center Weather Service Unit forecasters, assessment by the FAA W.J. Hughes Technical Center
- *Operational training for the user:* Hands-on training provided for Center Weather Service Unit and Weather Forecast Office forecasters as well as other users.

- *Next major program milestone:* The MSFS has been transitioned to the NWS and no additional work is planned in FY05.
- Program becomes operational: The MSFS transitioned to NWS in June 2004 and became operational in September 2004.
- *Plans for further improvements:* Transfer to NWS.

Terminal Convective Weather Forecast (TCWF)

PROGRAM.PROJECT: Aviation Weather Research Program/Convective Weather Product Development Team, [http://www.faa.gov/aua/awr/]

LEAD AGENCY/COLLABORATING AGENCIES: Federal Aviation Administration (FAA)/Massachusetts Institute of Technology, Lincoln Laboratory (MITLL), National Center for Atmospheric Research (NCAR) **LEAD AGENCY POINT OF CONTACT:** Gloria Kulesa, FAA/AWRP, 202-267-7289, gloria.kulesa@faa.gov **PROGRAM POINT OF CONTACT:** Marilyn Wolfson, MIT/LL, 781-981-3409, mwolfson@ll.mit.edu; Cindy Mueller, NCAR, 303-497-8485, mueller@ncar.edu

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: 2: 7, 12

FUNDING

• *Programmed/Planned* (\$'s/FY): /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: an automated 1- hr graphical forecast of convection for selected, high density terminal areas for FAA traffic managers.
- How operations will be changed/improved: provides vital convective weather information to air traffic managers for their use in air traffic flow management decision making to improve the safety and efficiency of the Nation's air traffic operations.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Convective Weather Product Development Team Technical Direction.
- *Program/Project verification process:* Monthly and quarterly reporting; program reviews; Research, Engineering, and Development Advisory Committee program assessments; science panel reviews; use of test beds for demonstrations and evaluations; and technical/human factors/user assessments.
- Method used for end product validation: Tested at Dallas/Ft. Worth, Orlando, New York, and Memphis airports.
- Operational training for the user: Hands-on training provided for terminal area users.

- Next major program milestone: N/A
- When program will become operational: FY06- Install TCWF at operational ITWS sites.
- Plans for further improvements: N/A

Weather Support to Decision Making (WSDM)

PROGRAM/PROJECT: Aviation Weather Research Program/Winter Weather Product Development Team [http://www.faa.gov/aua/awr/]

LEAD AGENCY/COLLABORATING AGENCIES: Federal Aviation Administration (FAA) and the National Center for Atmospheric Research (NCAR)

LEAD AGENCY POINT OF CONTACT: Gloria Kulesa, FAA/AWRP, 202-267-7289, gloria.kulesa@faa.gov **PROGRAM POINT OF CONTACT:** Roy Rasmussen, NCAR, 303-497-8430, rasmus@ucar.edu

SERVICE AREA(S)/INITIATIVE(S)

• *National Aviation Weather Initiatives*: **4:** 1, 3, 4, 5, 6

FUNDING

• *Programmed/Planned* (\$'s/FY): /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION

Product Improvement/Decision Support

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: automated, long- term forecasts for the WSDM integrated weather system.
- How operations will be changed/improved: WSDM provides vital information on weather parameters integral to the ground de-icing and airport surface clearing decision making process.

PROGRAM/PROJECT MANAGEMENT

- *Basic guidance document for this program:* Winter Weather Research Product Development Team Technical Direction and Seven Year Plan.
- *Program/Project verification process:* Monthly and quarterly reporting; program reviews; Research, Engineering, and Development Advisory Committee program assessments; science panel reviews; use of test beds for demonstrations and evaluations; and technical/human factors/user assessments.
- *Method used for end product validation:* Reconstruction of freezing/frozen precipitation events after major storms
- *Operational training for the user:* Hands-on training is provided by the private vendor who is marketing the system. The system is user friendly and requires no previous meteorological background to operate.

- Next major program milestone: FY06 airport field test 6 hr forecasts.
- *Program becomes operational:* WSDM was operationally implemented by a private vendor in the NYC area in 2003
- *Plans for further improvements:* Develop 12 hour forecasts of snow, freezing rain, ice pellets, snow pellets, frost, and freezing fog. Improve the performance of the hotplate precipitation gage for very low precipitation rates and high wind speed conditions.

Water Vapor Sensing System (WVSS)

PROGRAM/PROJECT: Aviation Weather Research Program [http://www.ofps.ucar.edu/wvss]

LEAD AGENCY/COLLABORATING AGENCIES: Federal Aviation Administration (FAA)/University

Corporation for Atmospheric Research (UCAR) and the National Oceanic and Atmospheric Administration (NOAA)

LEAD AGENCY POINT OF CONTACT: Gloria Kulesa, FAA/AWRP, 202-267-7289, gloria.kulesa@faa.gov

PROGRAM POINT OF CONTACT: Rex Fleming, UCAR, 303-497-8165, fleming@joss.ucar.edu

SERVICE AREA(S)/INITIATIVE(S)

National Aviation Weather Initiatives:
 1: 3 2: 4 5: 4.6

FUNDING

• *Programmed/Planned* (\$'s/FY): /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: a sensor to automatically obtain and continuously downlink moisture data from commercial aircraft.
- How operations will be changed/improved: moisture data will be used in numerical weather models to improve the accuracy of all weather parameters including wind, temperature, in-flight icing, ceiling, and visibility forecasts.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: The guidelines for this project are documented in an FAA-UCAR cooperative agreement.
- Program/Project verification process: Quarterly reporting; semi-annual program reviews, Research, Engineering, and Development Advisory Committee program assessments; science panel reviews; demonstrations and evaluations on air carrier aircraft.
- Method used for end product validation: Comparisons with rawinsonde observations and test sensors.
- *Operational training for the user:* Technical information is provided to numerical modelers who will incorporate the WVSS data into RUC, ETA, and other models.

- Next major program milestone: FY05- Technology transfer to NOAA.
- *Program becomes operational:* WVSS became operational in May 2004.
- *Plans for further improvements:* Install the second-generation atmospheric water vapor sensing system (WVSS-II) in commercial aircraft.

Flight Information Services Data Link (FISDL)

PROGRAM/PROJECT: http://www1.faa.gov/aua/FISDL/

<u>LEAD AGENCY/COLLABORATING AGENCIES</u>: Federal Aviation Administration **LEAD AGENCY POINT OF CONTACT:** Rick Heuwinkel, FAA/ARS, 202-385-7702,

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SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives:

1: 2 2: 2 3: 3 5: 2 6: 2 7: 3 8: 2

FUNDING

• *Programmed/Planned* (\$'s/FY): No government funding provided.

TYPE OF PROGRAM/APPLICATION

Acquisition/Product Dissemination

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: VHF broadcast from a network of ground stations to in-cockpit displays of General Aviation aircraft, presenting nation-wide flight information products. FISDL implemented through joint FAA-industry agreement. FAA provides VHF frequency channels and management oversight to include review, acceptance and quality control of products transmitted. Industry installs and operates the ground data processing and transmission network at no cost to the FAA. Basic text products are provided to aircraft equipped to receive FISDL service at no cost; value-added graphic products are available through a subscription fee. Honeywell (Bendix/King) is the industry FISDL Service Provider.
- *How operations will be changed/improved:* provides general aviation pilots with updated weather information while airborne and thereby improves the safety and efficiency of general aviation flight operations.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Requirements, Technology and Concepts for Aviation (RTCA)
 Minimum Aviation Systems Performance Standards (MASPS) for Flight Information Services-Broadcast (FIS-B) Data Link (DO-267, March 27, 2001)
- Program/Project verification process: Managed by FAA FISDL Office, AUA-460
- Method used for end product validation: FAA conducts periodic quality assessments of the FISDL transmissions.
- Operational training for the user: Text training materials are developed by the FISDL service provider (Honeywell) and are available on their website.

- Next major program milestone: National coverage projected to be complete by CY04.
- When program will become operational: Operational service began in January 2002.
- *Plans for further improvements:* Continued development and enhancement of value-added graphical products, to include new products developed through the Aviation Weather Research Program.

Meteorological Data Collection and Reporting System (MDCRS)

PROGRAM/PROJECT: http://www.arinc.com/products/weather/mdcrs.html

<u>LEAD AGENCY/COLLABORATING AGENCIES</u>: Federal Aviation Administration (FAA), National Oceanic and Atmospheric Administration (NOAA)/National Weather Service (NWS)

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SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives:

1:3 2:4 3:2,5,6 5:4,6 6:4

FUNDING

• Programmed/Planned (\$'s/FY): /FY04

TYPE OF PROGRAM/APPLICATION

Operational Improvement/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: the capability for appropriately equipped aircraft to automatically down link temperature, wind, and moisture data.
- How operations will be changed/improved: increases number of upper air observations being assimilated into numerical models thereby increasing forecast accuracy without increasing pilot workload.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Interface control document (ARINC).
- **Program/Project verification process:** Monthly reports, software testing (NWS).
- Method used for end product validation: N/A
- Operational training for the user: N/A

- Next major program milestone: N/A
- **Program becomes operational:** MDCRS is currently operational.
- Plans for further improvements: Continue to implement this capability with additional airlines.

Integrated Terminal Weather System (ITWS)

PROGRAM/PROJECT: Terminal Business Service [http://www2.faa.gov/ats/atb/sectors/weather/ITWS/]

LEAD AGENCY/ COLLABORATING AGENCIES: Federal Aviation Administration (FAA)

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dan.strawbridge@faa.gov

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives:

1: 8 **2:** 7 **6:** 1, 6, 11

FUNDING

• Programmed/Planned (\$'s/FY): /FY04 /FY05

TYPE OF PROGRAM/APPLICATION

Acquisition/Decision Support

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: a safety and planning tool for terminal air traffic management personnel to obtain, process, and display current and predictive weather information (alphanumeric and graphical). Products generated by ITWS include windshear and microburst predictions, storm cell and lightning information, terminal area winds aloft, runway winds, and short term ceiling and visibility predictions.
- How operations will be changed/improved: the ITWS presents a graphic display of weather in the terminal area out to 200 miles for improved air traffic management decision making.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: ITWS Acquisition Program Baseline (APB), Operational Requirements Document (ORD).
- Program/Project verification process: FAA Acquisition Management System (AMS).
- *Method used for end product validation:* Pre-recorded weather scenarios are run on the system. If the system output is what is expected, the system is certified.
- *Operational training for the user:* Air Traffic and Airway Facility training will be conducted before site acceptance.

- Next major program milestone: N/A
- Program becomes operational: ITWS is an operational system.
- Plans for further product improvements: P3I products planned to start in FY03 include: Dry Microburst and Sensor Data Quality Algorithms; NEXRAD Vertical Integrated Liquid water with large TRACON mosaic and NEXRAD open systems upgrades; Free Flight Phase II (FFP II) and Automation Systems Interfaces; Machine Intelligent Gust Front Algorithm (MIGFA) improvements; and Terminal Winds Forecast improvements.

Weather and Radar Processor (WARP)

PROGRAM/PROJECT: http://www2.faa.gov/aua/ipt_prod/weather/warp/

<u>LEAD AGENCY/COLLABORATING AGENCIES</u>: Federal Aviation Administration (FAA), National Oceanic and Atmospheric Administration (NOAA)/National Weather Service (NWS)

LEAD AGENCY POINT OF CONTACT: Kevin Young, AUA-460, 202-366-9207, kevin.young@faa.gov **PROGRAM POINT OF CONTACT:** Alfred Moosakhanian, AUA-460, 202-267-9152,

alfred.moosakhanian@faa.gov

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: N/A

FUNDING

• *Programmed/Planned* (\$'s/FY): \$13.8M /FY03 /FY04

TYPE OF PROGRAM/APPLICATION

Acquisition/Decision Support

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: an upgraded weather processor and workstation that receives and consolidates weather data from multiple sources (includes WSR-88D) into a single database. The Weather and Radar Processor (WARP) is being procured to provide an enhanced weather information capability for air traffic controllers, area supervisors, and Center Weather Service Unit meteorologists.
- How operations will be changed/improved: will analyze, generate and display specialized, value-added aviation weather products to support en-route air traffic control operations. Permits air traffic controllers to see aircraft and hazardous convective weather on the same scope

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: WARP Operational Requirements Document.
- *Program/Project verification process:* FAA Acquisition Management System (AMS) verification process.
- Method used for end product validation: Products are received from certified vendors or National Weather Service distribution.
- *Operational training for the user:* Equipment familiarization is provided prior to installation and operator training is provided during installation.

- Next major program milestone: N/A
- **Program becomes operational:** WARP is an operational system.
- *Plans for further improvements:* Multifaceted product improvement plan has been implemented with this program.

Collaborative Decision Making Network (CDMNet)

PROGRAM/PROJECT: http://www.metronaviation.com/cdm/products/cdmnet1.html

LEAD AGENCY: Federal Aviation Administration (FAA)

LEAD AGENCY POINT OF CONTACT: James Wetherly, AUA-740, 703-326-3841, james.wetherly@faa.gov **PROGRAM POINT OF CONTACT**: James Wetherly, AUA-740, 703-326-3841, james.wetherly@faa.gov

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives:

1: 9 **2:** 8 **5:** 7 **6:** 5 **7:** 6 **8:** 3

FUNDING

• **Programmed/Planned** (\$'s/FY): CDMNet is independently funded and maintained through private industry. The only federal funding is the cost of maintaining and securing the demarcation access point from within the FAA and the cost associated with research, development and/or deployment and operation of existing and/or new weather information.

TYPE OF PROGRAM/APPLICATION

Operational Improvement/Product Dissemination

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: a communication link which disseminates operational information (e.g., convective weather forecasts) between FAA and National Airspace System users for traffic flow management purposes.
- How operations will be changed/improved: improves dissemination of weather information to aviation users and air traffic managers for collaborative decision making regarding operations in the national airspace system.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: N/A
- *Program/Project verification process:* Information currently not available.
- Method used for end product validation: Information currently not available.
- Operational training for the user: N/A

- Next major program milestone: N/A
- Program becomes operational: CDMNet is infrastructure that has been operational since 1997.
- *Plans for further improvements*: No specific plans at this point. Upgrading the network is primarily driven by industry forces.

Weather Message Switching Center Replacement (WMSCR)

PROGRAM/PROJECT: http://www.aos.tc.faa.gov/aos500/AOS540/home.htm

LEAD AGENCY: Federal Aviation Administration (FAA)

LEAD AGENCY POINT OF CONTACT: Tammye Jenkins, ARS-100, 202-366-8073, tammye.jenkins@faa.gov

PROGRAM POINT OF CONTACT: Soncere Whitecloud, AOS-540, 609-485-8244

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives:

1: 9 **2:** 8 **5:** 7 **6:** 5 **7:** 6 **8:** 3

FUNDING

• Programmed/Planned (\$'s/FY): /FY03 /FY04

TYPE OF PROGRAM/APPLICATION

Operational Improvement/Product Dissemination

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: a replacement for the single Weather Message Switching Center (WMSC) that receives, processes and stores alphanumeric aviation weather products and disseminates these products to FAA and non-FAA users. It is the principal gateway to NWS, the DoD, and foreign countries for the exchange of weather data.
- How operations will be changed/improved: the two nodes of the WMSCR provide geographical redundancy and increase operational availability.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: N/A
- Program/Project verification process: N/A
- Method used for end product validation: N/A
- Operational training for the user: N/A

- Next major program milestone: N/A
- Program becomes operational: WMSCR is an operational system.
- Plans for further improvements: N/A

Operational and Supportability Implementation System (OASIS)

PROGRAM/PROJECT: [http://www.faa.gov/aua/oasis/]

LEAD AGENCY/ COLLABORATING AGENCIES: Federal Aviation Administration (FAA)

LEAD AGENCY POINT OF CONTACT: Rudy Watkins, FAA/ATO-D, rudy.watkins@faa.gov

PROGRAM POINT OF CONTACT: Ron Richardson, FAA/ATO-D, 202-385-8415, ronald.richardson@faa.gov

SERVICE AREA(S)/INITIATIVE(S)

National Aviation Weather Initiatives:
 1: 9
 2: 8
 5: 7
 6: 5
 7: 6
 8: 3

FUNDING: (F&E Baseline)

• Programmed/Planned (\$'s/FY): /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION

Acquisition/Decision Support

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: a commercial off-the-shelf/non-developmental item (COTS/NDI) system that enhances the air traffic specialist's ability to provide flight plan processing, weather briefing information, and search and rescue services in support of general aviation pilots. OASIS is being developed to eventually update weather operations workstations at 61 Automated Flight Service Stations.
- How operations will be changed/improved: The OASIS system will provide for on-going operational support, enabling flight service specialists to more efficiently provide weather and flight information for general aviation pilots. OASIS will provide significant improvement in the computer-human interface by replacing the existing consoles and providing displays with a graphical user interface.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: OASIS Integrated Program Plan.
- **Program/Project verification process:** Planned formal reviews for OASIS include: Test Readiness Reviews; a functional configuration audit (FCA); periodic system engineering reviews; technical exchange meetings (TEMs) as required; and, program management reviews (PMRs).
- *Method used for end product validation:* The scope of the OASIS T&E program encompasses all testing conducted during the OASIS program life cycle. The T&E program is comprised of the following phases: system test, IOT&E phase, field familiarization, and Final Operational Capability (FOC) acceptance T&E.
- Operational training for the user: The FAA Academy instructors will train a cadre of instructors for each site.
 Training for the qualified FSS specialists currently at the sites will be conducted by the site Cadre instructors between the time the equipment is deployed to the site and the site is commissioned. Classroom instruction, text materials, and hands-on training methods will be utilized. The contractor will conduct training for FAA maintenance technicians at each site during initial deployment.

- Next major program milestone: ISD005 software upgrade scheduled to begin January 2005.
- Program becomes operational: The In-Service Decision (ISD) for OASIS took place in June 2002.
- Plans for further improvements: 16 sites are installed and operational as of July 2004. Future installations are
 on hold pending the outcome of the AFSS A-76 decision (March 2005). The ISD005 software upgrade will
 incorporate, among other features, a direct connection to the US NOTAMs Server (USNS) that will enable
 OASIS to display ICAO, military and local NOTAMs, and will sort Temporary Flight Restrictions (TFRs) so
 that presidential and security TFRs are located at the top of the list..

Oceanic Cloud Top Height (OCTH)

PROGRAM/PROJECT: Aviation Weather Research Program/Oceanic Weather Product Development Team [http://www.rap.ucar.edu/projects/owpdt/]

LEAD AGENCY/COLLABORATING AGENCIES: Federal Aviation Administration (FAA)/National Center for Atmospheric Research (NCAR), MIT/LL, Naval Research Laboratory, and the Aviation Weather Center **LEAD AGENCY POINT OF CONTACT:** Gloria Kulesa, FAA/AWRP, 202-267-7289, gloria.kulesa@faa.gov **PROGRAM POINT OF CONTACT:** Cathy Kessinger, NCAR/RAP, 303-497-8481, kessinger@ucar.edu

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives:

FUNDING

• *Programmed/Planned* (\$'s/FY): /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION:

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: automated graphic showing height of clouds relative to flight level derived from infrared satellite imagery and corrected for non-standard atmospheric lapse rate.
- How operations will be changed/improved: Enhanced safety over oceanic and remote regions through highresolution (space and time) alerting of hazard areas.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Oceanic Weather Product Development Team Technical Direction and Seven Year Plan.
- Program/Project verification process: Monthly and quarterly reporting; program reviews; Research,
 Engineering, and Development Advisory Committee program assessments; science panel reviews; use of test
 beds for demonstrations and evaluations; Aviation Weather Technology Transfer Board decisions; and
 technical/human factors/user assessments.
- *Method used for end product validation:* Human (pilot) reporting; comparison to other satellite imagery; verification of algorithms over data-rich regions such as the Gulf of Mexico and CONUS.
- *Operational training for the user:* Text, hands-on, and distance learning (web-based).

- *Next major program milestone*: Decision for experimental use 3QFY05.
- Program becomes operational: FY07.
- *Plans for further improvements:* Integrate diagnostics and/or cloud classification algorithms that will more precisely distinguish convection from non-convective clouds.

Oceanic Convective Diagnosis (OCD)

PROGRAM/PROJECT: Aviation Weather Research Program/Oceanic Weather Product Development Team [http://www.rap.ucar.edu/projects/owpdt]

LEAD AGENCY/COLLABORATING AGENCIES: Federal Aviation Administration (FAA)/National Center for Atmospheric Research (NCAR), MIT/LL, Naval Research Laboratory, and the Aviation Weather Center **LEAD AGENCY POINT OF CONTACT:** Gloria Kulesa, FAA/AWRP, 202-267-7289, gloria.kulesa@faa.gov **PROGRAM POINT OF CONTACT:** Cathy Kessinger, NCAR/RAP, 303-497-8481, kessinger@ucar.edu

SERVICE AREA(S)/INITIATIVE(S)

National Aviation Weather Initiatives:2: 1

FUNDING

Programmed/Planned (\$'s/FY): /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION:

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: expert system framework that merges cloud top height, oceanic lightning, and cloud classification algorithms to produce an automated, true diagnosis of convection relative to flight level in remote/oceanic regions.
- How operations will be changed/improved: Enhanced safety over oceanic and remote regions through high-resolution (space and time) alerting of hazard areas.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Oceanic Weather Product Development Team Technical Direction and Seven Year Plan.
- Program/Project verification process: Monthly and quarterly reporting; program reviews; Research,
 Engineering, and Development Advisory Committee program assessments; science panel reviews; use of test
 beds for demonstrations and evaluations; Aviation Weather Technology Transfer Board decisions; and
 technical/human factors/user assessments.
- *Method used for end product validation:* Human (pilot) reporting; comparison to other satellite imagery; verification of algorithms over data-rich regions such as the Gulf of Mexico and CONUS.
- Operational training for the user: Text, hands-on, and distance learning (web-based).

- Next major program milestone: Decision for experimental use 3QFY06.
- Program becomes operational: FY09.
- *Plans for further improvements:* Other data sets and diagnostics will be added as diagnostic skill is demonstrated (FY05 and beyond).

Oceanic Convective Nowcast (OCN)

PROGRAM/PROJECT: Aviation Weather Research Program/Oceanic Weather Product Development Team [http://www.rap.ucar.edu/projects/owpdt]

LEAD AGENCY/COLLABORATING AGENCIES: Federal Aviation Administration (FAA)/National Center for Atmospheric Research (NCAR), MIT/LL, Naval Research Laboratory, and the Aviation Weather Center **LEAD AGENCY POINT OF CONTACT:** Gloria Kulesa, FAA/AWRP, 202-267-7289, gloria.kulesa@faa.gov **PROGRAM POINT OF CONTACT:** Cathy Kessinger, NCAR/RAP, 303-497-8481, kessinger@ucar.edu

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: 2: 10

FUNDING

• Programmed/Planned (\$'s/FY): /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION:

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: expert system framework that merges convective diagnosis, oceanic wind fields, data sets, and other algorithms to produce a 0-2 hour automated nowcast of convection relative to flight level in remote/oceanic regions.
- How operations will be changed/improved: Enhanced safety over oceanic and remote regions through high-resolution (space and time) alerting of hazard areas. Added ability to strategically plan around areas of convection at flight level.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Oceanic Weather Product Development Team Technical Direction and Seven Year Plan.
- Program/Project verification process: Monthly and quarterly reporting; program reviews; Research,
 Engineering, and Development Advisory Committee program assessments; science panel reviews; use of test
 beds for demonstrations and evaluations; Aviation Weather Technology Transfer Board decisions; and
 technical/human factors/user assessments.
- *Method used for end product validation:* Human (pilot) reporting; comparison to other satellite imagery; verification of algorithms over data-rich regions such as the Gulf of Mexico and CONUS.
- Operational training for the user: Text, hands-on, and distance learning (web-based).

- Next major program milestone: Decision for developmental testing 1QFY06.
- Program becomes operational: FY10
- *Plans for further improvements:* Continued R&D leading to an operating prototype in the laboratory by the end of FY05. Continue to investigate techniques and algorithms that could support longer-range convective forecasts out to 15 hours.

Turbulence Forecast, Oceanic (TFO)

PROGRAM/PROJECT: Aviation Weather Research Program/ Oceanic Weather Product Development Team [http://www.rap.ucar.edu/projects/owpdt]

LEAD AGENCY/COLLABORATING AGENCIES: Federal Aviation Administration (FAA)/National Center for Atmospheric Research (NCAR), MIT/LL, Naval Research Laboratory, and the Aviation Weather Center **LEAD AGENCY POINT OF CONTACT:** Gloria Kulesa, FAA/AWRP, 202-267-7289, gloria.kulesa@faa.gov **PROGRAM POINT OF CONTACT:** Cathy Kessinger, NCAR/RAP, 303-497-8481, kessinger@ucar.edu

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: 7:10

FUNDING

• *Programmed/Planned* (\$'s/FY): /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION:

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: expert system framework that merges oceanic data sets, wind fields, and other algorithms to produce an automated 0-6 hour forecast of clear air turbulence (CAT) relative to flight level in remote/oceanic regions.
- How operations will be changed/improved: Enhanced safety over oceanic and remote regions through highresolution (space and time) alerting of turbulence hazard areas.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Oceanic Weather Product Development Team Technical Direction and Seven Year Plan.
- Program/Project verification process: Monthly and quarterly reporting; program reviews; Research,
 Engineering, and Development Advisory Committee program assessments; science panel reviews; use of test
 beds for demonstrations and evaluations; Aviation Weather Technology Transfer Board decisions; and
 technical/human factors/user assessments.
- *Method used for end product validation:* Human (pilot) reporting; comparison to other satellite imagery; verification of algorithms over data-rich regions such as the Gulf of Mexico and CONUS.
- *Operational training for the user:* Text, hands-on, and distance learning (web-based).

- Next major program milestone: Decision for experimental use (D3) 1QFY07.
- Program becomes operational: FY09
- Plans for further improvements: Future integration of convective induced turbulence (CIT) diagnostics as they are developed and tested.

Volcanic Ash Coordination Tool (VACT)

PROGRAM/PROJECT: Aviation Weather Research Program/Aviation Forecasts Product Development Team **LEAD AGENCY/COLLABORATING AGENCIES:** Federal Aviation Administration (FAA)/National Oceanic and Atmospheric Administration (NOAA)

<u>LEAD AGENCY POINT OF CONTACT</u>: Gloria Kulesa, FAA/AWRP, 202-267-7289, gloria.kulesa@faa.gov **PROGRAM POINT OF CONTACT**: Lynn Sherretz, NOAA (FSL), 303-497-5580, lynn.sherretz@noaa.gov

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: 8: 1

FUNDING

• *Programmed/Planned* (\$'s/FY): /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION:

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: extend the current capabilities of the FX-Collaborate (FXC) and AWIPS systems to include volcanic ash data sets, dispersion models, and tools for generating volcanic ash products in order to meet the goal of creating a consistent set of advisories, which originate from different organizations.
- How operations will be changed/improved: VACT will enable forecasters to simultaneously view identical displays of meteorological information and collaborate in real-time to generate fully-consistent time-critical advisories and forecasts for ash.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Aviation Forecasts Product Development Team Technical Direction and Seven Year Plan.
- Program/Project verification process: Monthly and quarterly reporting; program reviews; Research,
 Engineering, and Development Advisory Committee program assessments; science panel reviews; use of test
 beds for demonstrations and evaluations; Aviation Weather Technology Transfer Board decisions; and
 technical/human factors/user assessments.
- *Method used for end product validation:* Testing at the Alaska Volcanic Ash Advisory Center (VAAC), Center Weather Service Unit (CWSU), and Volcanic Observatory (AVO).
- Operational training for the user: Hands-on training for VAAC, CWSU, Volcanic Observatory personnel.

- *Next major program milestone:* FY05- implement new versions of VACT at the Anchorage VAAC, CWSU, and Volcanic Observatory.
- Program becomes operational: TBD
- Plans for further improvements: add additional satellite, radar, and dispersion model data sets to the VACT.

Automated Weather Observing System/Automated Surface Observing System (AWOS/ASOS)

PROGRAM/PROJECT: Terminal Business Service [http://www2.faa.gov/asos/]
 LEAD AGENCY/COLLABORATING AGENCIES: Federal Aviation Administration (FAA)
 LEAD AGENCY POINT OF CONTACT: Kevin Young, AUA-460, 202-366-9207, kevin.young@faa.gov
 PROGRAM POC: Dan Strawbridge, FAA/ATO-T-SSE, 202-385-8671, dan.strawbridge@faa.gov

SERVICE AREA(S)/INITIATIVE (S)

• National Aviation Weather Initiatives: 1: 7

FUNDING

• Programmed/Planned (\$'s/FY): /FY04 /FY05

TYPE OF PROGRAM/APPLICATION

Product Improvement/Decision Support

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: a suite of sensors, which measures, collects and broadcasts weather data to help meteorologists, pilots and flight dispatchers prepare and monitor weather forecasts, plan flight routes, and provide necessary information for correct takeoffs and landings.
- How will operations be changed/improved: The system provides continuous data on conditions for the runway environment. The computer-generated voice broadcasts give pilots updates critical to safe landings.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: N/A
- Program/Project verification process: N/A
- Method used for product validation: N/A
- Operational training for the user: N/A

- Next major program milestone: N/A
- **Program becomes operational:** AWOS/ASOS is an operational system.
- *Plans for further improvements:* Continue sensor upgrades as technology permits.

Low Level Wind Shear Alert System (LLWAS) Improvements

PROGRAM/PROJECT: Terminal Business Service

LEAD AGENCY/COLLABORATING AGENCIES: Federal Aviation Administration (FAA)

LEAD AGENCY POINT OF CONTACT: Dan Kinder, FAA-ATB-400, 202-267-7198, dan.kinder@faa.gov

PROGRAM POC: Dan Strawbridge, FAA/ATO-T-SSE, 202-385-8671, dan.strawbridge@faa.gov

SERVICE AREA(S)/INITIATIVE (S)

• National Aviation Weather Initiatives: 6: 6

FUNDING

• Programmed/Planned (\$'s/FY): /FY04 /FY05

TYPE OF PROGRAM/APPLICATION

Product Improvement/Decision Support

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: system improvements to better detect the presence of low level wind shear. LLWAS-Network Expansion (NE) is an upgraded system at 9 major airports; LLWAS-Relocation(R) improves performance by relocating or replacing poles impacted by wind shielding or sheltering conditions; LLWAS-Sustainment (S) extends the service life of the LLWAS systems located at 40 non-TDWR/WSP airports.
- How will operations be changed/improved: better detection of low level wind shear around airports will result
 in safer operations.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: N/A
- Program/Project verification process: N/A
- Method used for product validation: N/A
- Operational training for the user: N/A

- Next major program milestone: N/A
- Program becomes operational: LLWAS-NE and LLWAS-RS are operational systems.
- Plans for further improvements: N/A

Rapid Update Cycle (RUC) Model

PROGRAM/PROJECT: Aviation Weather Research Program/Model Development & Enhancements Product Development Team [http://www1.faa.gov/aua/awr/]

<u>LEAD AGENCY/COLLABORATING AGENCIES:</u> Federal Aviation Administration (FAA)/ the National Oceanic and Atmospheric Administration (NOAA)

<u>LEAD AGENCY POINT OF CONTACT:</u> Gloria Kulesa, FAA/AWRP, 202-267-7289, gloria.kulesa@faa.gov **PROGRAM POINT OF CONTACT:** Steve Koch, NOAA/FSL, 303-497-5487, steven.koch@noaa.gov

SERVICE AREA(S)/INITIATIVE (S)

• National Aviation Weather Initiatives: 1: 11, 13 2: 11, 12 3: 7 6: 10

FUNDING

• Programmed/Planned (\$'s/FY): /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: improvements to the RUC model that will allow better analyses and predictions of hazardous aviation impact variables.
- How will operations be changed/improved: improve safety of flight operations within the National Airspace System.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Model Development and Enhancements Product Development Team Technical Direction and Seven Year Plan.
- *Program/Project verification process:* Monthly and quarterly reporting; program reviews; Research, Engineering, and Development Advisory Committee program assessments; science panel reviews; use of test beds for demonstrations and evaluations; technical/human factors/user assessments.
- Method used for product validation: Retrospective and real-time testing and comparison of results with
 observations.
- Operational training for the user: N/A

- Next major program milestone: To be replaced by the Weather Research Forecast model in 2007.
- Program becomes operational: RUC-20 became operational in 2002.
- *Plans for further improvements:* Higher resolution version of the RUC model consistent with enhancements to NCEP's computational resources. Incorporate model upgrades that improve cloud and moisture analyses and model physics that affects icing.

Automated Weather Observing System (AWOS) Data Acquisition System (ADAS)

PROGRAM/PROJECT:

LEAD AGENCY/COLLABORATING AGENCIES: Federal Aviation Administration

LEAD AGENCY POINT OF CONTACT:

PROGRAM POC: Dan Strawbridge, FAA/ATO-T-SSE, 202-385-8671, dan.strawbridge@faa.gov

SERVICE AREA(S)/INITIATIVE (S)

• National Aviation Weather Initiatives:

1:9 6:5

FUNDING

• Programmed/Planned (\$'s/FY): /FY03 /FY04

TYPE OF PROGRAM/APPLICATION

Dissemination

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: The AWOS Data Acquisition System (ADAS) collects automated surface observations from AWOSs and ASOSs within the ARTCC boundaries and distributes to selected FAA systems for further distribution. Automated lightning detection and reporting system (ALDARS) functions are implemented on the ADAS. The ADAS provides lightning data to enable the AWOSs and ASOSs to report on the range and direction of lightning and thunderstorm activity affecting an airport.
- How will operations be changed/improved:

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: N/A
- Program/Project verification process: N/A
- Method used for product validation: N/A
- Operational training for the user: N/A

- Next major program milestone: N/A
- Program becomes operational: All 22 ADAS systems are commissioned.
- Plans for further improvements: N/A

Regional Convective Weather Forecast (RCWF)

PROGRAM/PROJECT: Aviation Weather Research Program/Convective Weather Product Development Team, [http://www1.faa.gov/aua/awr/]

LEAD AGENCY/COLLABORATING AGENCIES: Federal Aviation Administration (FAA) and the Massachusetts Institute of Technology, Lincoln Laboratory (MITLL)

LEAD AGENCY POINT OF CONTACT: Gloria Kulesa, FAA/AWRP, 202-267-7289, gloria.kulesa@faa.gov **PROGRAM POINT OF CONTACT:** Marilyn Wolfson, MIT/LL, 781-981-3409, mwolfson@ll.mit.edu; Cindy Mueller, NCAR, 303-497-8485, mueller@ncar.edu

SERVICE AREA(S)/INITIATIVE (S)

• National Aviation Weather Initiatives: N/A

FUNDING

• *Programmed/Planned (\$'s/FY):* /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: a 2 hr product associated with the Corridor Integrated Weather System (CIWS) testbed.
- How will operations be changed/improved: See CIWS (FAA-40)

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Convective Weather Product Development Team Technical Direction and Seven Year Plan.
- *Program/Project verification process:* Monthly and quarterly reporting; program reviews; Research, Engineering, and Development Advisory Committee program assessments; science panel reviews; use of test beds for demonstrations and evaluations; and technical/human factors/user assessments.
- Method used for product validation: Developmental and operational testing and comparison of results with
 observations.
- Operational training for the user: N/A

- Next major program milestone: N/A
- Program becomes operational: Currently no plans for the RCWF to become a stand alone operational product.
- Plans for further improvements: N/A

Satellite-Based Icing Detection (SBID)

PROGRAM/PROJECT: Aviation Weather Research Program,/In-Flight Icing Product Development Team, [[http://www.faa.gov/aua/awr/]

LEAD AGENCY/COLLABORATING AGENCIES: Federal Aviation Administration (FAA)/ National Aeronautics and Space Agency (NASA)

<u>LEAD AGENCY POINT OF CONTACT</u>: Gloria Kulesa, FAA/AWRP, 202-267-7289, gloria.kulesa@faa.gov **PROGRAM POINT OF CONTACT**: Marcia Politovich, NCAR, 303-497-8449, marcia@ucar.edu

SERVICE AREA(S)/INITIATIVE (S)

• National Aviation Weather Initiatives: N/A See FAA-6

FUNDING

Programmed/Planned (\$'s/FY): /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: this is a component of the Current Icing Potential (CIP) product (FAA-6).
- How will operations be changed/improved: satellite-based icing detection contributes to improved in-flight icing products for avoiding areas of potential icing.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: In-Flight Icing Product Development Team Technical Direction and Seven Year Plan.
- *Program/Project verification process:* Monthly and quarterly reporting; program reviews; Research, Engineering, and Development Advisory Committee program assessments; science panel reviews; use of test beds for demonstrations and evaluations; Aviation Weather Technology Transfer Board decisions; and technical/human factors/user assessments.
- Method used for product validation: N/A
- Operational training for the user: N/A

- Next major program milestone: N/A
- *Program becomes operational:* The CIP product became operational in March 2002.
- Plans for further improvements: N/A

Ground-based Remote Icing Detection System (GRIDS)

PROGRAM/PROJECT: Aviation Weather Research Program,/Advanced Weather Radar Techniques Product Development Team, [http://www.faa.gov/aua/awr/]

LEAD AGENCY/COLLABORATING AGENCIES: Federal Aviation Administration (FAA)/National Oceanic and Atmospheric Administration (NOAA)

<u>LEAD AGENCY POINT OF CONTACT:</u> Gloria Kulesa, FAA/AWRP, 202-267-7289, gloria.kulesa@faa.gov **PROGRAM POINT OF CONTACT:** Kim Elmore, NOAA NSSL, 405-366-0458, kim.elmore@noaa.gov

SERVICE AREA(S)/INITIATIVE (S)

• National Aviation Weather Initiatives: N/A

FUNDING

• Programmed/Planned (\$'s/FY): /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION

R&D

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: technology for the ground-based detection of in-flight icing using a microwave radiometer and a millimeter cloud radar.
- How will operations be changed/improved: provide the ability to avoid areas of icing, including Supercoled-Large Droplets (SLD), which pose a serious icing threat to en-route aircraft.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: In-Flight Icing and Advanced Weather Radar Techniques Product Development Team's Technical Direction and Seven Year Plans.
- *Program/Project verification process:* Monthly and quarterly reporting; program reviews; Research, Engineering, and Development Advisory Committee program assessments; science panel reviews; use of test beds for demonstrations and evaluations.
- Method used for product validation: N/A
- Operational training for the user: N/A

- Next major program milestone: decision for use
- Program becomes operational: GRIDS is primarily a research system and is intended for no more than limited
 operations.
- Plans for further improvements: N/A

Corridor Integrated Weather System (CIWS)

PROGRAM/PROJECT:

<u>LEAD AGENCY/COLLABORATING AGENCIES:</u> Federal Aviation Administration (FAA) <u>LEAD AGENCY POINT OF CONTACT:</u> Ray Moy, ATO-E, 202-385-8412, raymond.moy@faa.gov <u>PROGRAM POINT OF CONTACT:</u> Ray Moy, ATO-E, 202-385-8412, raymond.moy@faa.gov

SERVICE AREA(S)/INITIATIVE (S)

• National Aviation Weather Initiatives: 2: 1

FUNDING

Programmed/Planned (\$'s/FY): \$4.0M/FY05 \$0/FY06 \$0/FY07

TYPE OF PROGRAM/APPLICATION

Decision Support

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: CIWS is a demonstration program which provides air traffic flow managers with accurate, automated, high update rate information on convective storm locations and echo tops, along with 2-hour animated growth and decay forecasts. The CIWS demonstration provides convective weather products to a total of fifteen FAA facilities (ARTCC and TRACON). The area of coverage is the high congestion corridor from Boston thru Minneapolis (east west) and Boston thru Washington DC (north south). CIWS also incorporates Canadian radar data to provide coverage on the northern playbook routes utilizing Canadian airspace.
- How will operations be changed/improved: Provides common situation awareness to all air traffic flow
 managers of convective activity in the high congestion corridor. This allows managers to improve efficient
 tactical use of the airspace, enhance delay reduction due to convective activity and potential to reduce
 controller workload.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: N/A
- Program/Project verification process: N/A
- Method used for product validation: N/A
- Operational training for the user: N/A

- Next major program milestone: FAA Initial Investment Decision (to define program scope and schedule)
- Program becomes operational: TBD
- Plans for further improvements: TBD

Radar Turbulence Detection Algorithm (RTDA)

PROGRAM/PROJECT: Aviation Weather Research Program/Advanced Weather Radar Techniques Product Development Team [http://www.faa.gov/aua/awr/]

LEAD AGENCY/COLLABORATING AGENCIES: Federal Aviation Administration (FAA)/National Center for Atmospheric Research (NCAR); National Oceanic and Atmospheric Administration (NOAA) National Severe Storms Laboratory (NSSL)

LEAD AGENCY POINT OF CONTACT: Gloria Kulesa, FAA/AWRP, 202-267-7289, gloria.kulesa@faa.gov **PROGRAM POINT OF CONTACT:** Bob Sharman, NCAR, 303-497-8457, sharman@ucar.edu; Kim Elmore, NOAA NSSL, 405-366-0458, kim.elmore@noaa.gov

SERVICE AREA(S)/INITIATIVE (S)

• National Aviation Weather Initiatives: 7: 12

FUNDING

• Programmed/Planned (\$'s/FY): /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: capability to detect areas of primarily convectively induced turbulence from WSR-88D radar data.
- How will operations be changed/improved: allow aircraft to avoid areas of turbulence and therefore reduce injuries caused by unexpected encounters with turbulence.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Advanced Weather Radar Techniques Product Development Team Technical Direction and Seven Year Plan.
- *Program/Project verification process:* Monthly and quarterly reporting; semi-annual program reviews; science panel reviews; NEXRAD Tri-Agency approval process.
- *Method used for product validation:* Validation of product improvements via comparison of output data with Pilot Reports and field testing using research aircraft.
- *Operational training for the user:* hands-on training.

- Next major program milestone: 4QFY05: RTDA decision meeting by the NEXRAD Technical Advisory Committee (TAC).
- *Program becomes operational:* FY07: Dependent on decision by the NEXRAD Program Management Committee (PMC).
- *Plans for further improvements:* Investigate potential for using RTDA with other terminal radars such as the TDWR, ASR-9, and ASR-11.

Next Generation Runway Visual Range (RVR)

PROGRAM/PROJECT: RVR Program Office [www.faa.gov/aua/aua700]
LEAD AGENCY/COLLABORATING AGENCIES: Federal Aviation Administration (FAA)
LEAD AGENCY POINT OF CONTACT: James Wetherly, AUA-740, 703-326-3841, james.wetherly@faa.gov
PROGRAM POINT OF CONTACT:

SERVICE AREA(S)/INITIATIVE (S)

• National Aviation Weather Initiatives: 1: 12

FUNDING

• Programmed/Planned (\$'s/FY): /FY04

TYPE OF PROGRAM/APPLICATION

Acquisition/Decision Support

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: capability to collect RVR data from 48 major airports in near real-time and distribute to controllers and airline operation centers.
- How will operations be changed/improved: the ability to readily access real-time information provides enhanced traffic flow management collaborative decision making.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: N/A
- Program/Project verification process: N/A
- Method used for product validation: N/A
- Operational training for the user: N/A

- Next major program milestone: N/A
- *Program becomes operational:* System is currently operational.
- *Plans for further improvements:* RVR data will be collected from an additional 31 airports when these airports receive the New Generation RVR equipment.

National Ceiling and Visibility (NCV)

PROGRAM/PROJECT: Aviation Weather Research Program/National Ceiling and Visibility Product Development Team, [http://www.faa.gov/aua/awr/]

LEAD AGENCY/COLLABORATING AGENCIES: Federal Aviation Administration (FAA)/National Center for Atmospheric Research (NCAR)

LEAD AGENCY POINT OF CONTACT: Gloria Kulesa, FAA/AWRP, 202-267-7289, gloria.kulesa@faa.gov **PROGRAM POINT OF CONTACT:** Paul Herzegh, NCAR, 303-497-2820, herzegh@ucar.edu

SERVICE AREA(S)/INITIATIVE (S)

• National Aviation Weather Initiatives: 1: 1

FUNDING

Programmed/Planned (\$'s/FY): /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: using an integrated approach, clata from pilot reports, radar, satellites, surface observations, and numerical model output will be blended into automated C&V analysis and forecast products.
- **How will operations be changed/improved:** improved analyses and forecasts of ceiling and visibility will contribute to reduced general aviation accidents.

PROGRAM/PROJECT MANAGEMENT

- *Basic guidance document for this program:* National Ceiling and Visibility Product Development Team Technical Direction and Seven Year Plan.
- Program/Project verification process: Monthly and quarterly reporting; program reviews; Research,
 Engineering, and Development Advisory Committee program assessments; science panel reviews; use of test
 beds for demonstrations and evaluations; Aviation Weather Technology Transfer Board decisions; and
 technical/human factors/user assessments.
- *Method used for product validation:* Verification of product improvements via the real-time verification system.
- *Operational training for the user:* Information on the C&V analysis product is available on ADDS web site; http://adds.aviationweather.gov.

- *Next major program milestone:* Experimental decision for the CONUS analysis product in FY 05 and the forecast product experimental decision in FY 06.
- Program becomes operational: FY08.
- Plans for further improvements: Alaska analysis and forecast products in FY09.

Terminal Ceiling and Visibility (TCV)

PROGRAM/PROJECT: Aviation Weather Research Program/Terminal Ceiling & Visibility Product Development Team [http://www.faa.gov/aua/awr/]

LEAD AGENCY/COLLABORATING AGENCIES: Federal Aviation Administration (FAA)/MIT/LL **LEAD AGENCY POINT OF CONTACT:** Gloria Kulesa, FAA/AWRP, 202-267-7289, gloria.kulesa@faa.gov **PROGRAM POINT OF CONTACT:** Dave Clark, MIT/LL, 781-981-3684, davec@ll.mit.edu

SERVICE AREA(S)/INITIATIVE (S)

• National Aviation Weather Initiatives:

FUNDING

Programmed/Planned (\$'s/FY): /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: capability to provide automated forecasts for airports that have problems due to low ceilings and visibilities associated synoptic scale extratropical systems that frequent the northeast quadrant of the United States during the months of November through April.
- How will operations be changed/improved: allow air traffic operations to anticipate the real-time impact of winter storms on capacity to support strategic and tactical air traffic planning and on safety especially for General Aviation.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Terminal C&V Product Development Team Technical Direction and Seven Year Plan.
- **Program/Project verification process:**: Monthly and quarterly reporting; program reviews; Research, Engineering, and Development Advisory Committee program assessments; science panel reviews; use of test beds for demonstrations and evaluations; Aviation Weather Technology Transfer Board decisions; and technical/human factors/user assessments.
- Method used for product validation: Verification of product improvements via the real-time verification system.
- Operational training for the user: Hands-on training to be provided to traffic management personnel.

- *Next major program milestone*: Use of the NYC Integrated Terminal Weather System as a test-bed for Northeast C&V trial products began in FY04.
- Program becomes operational: TBD
- Plans for further improvements: N/A

Juneau Airport Wind System (JAWS)

PROGRAM/PROJECT: Terminal Business Service [http://www2.faa.gov/aua/ipt_prod/weather/jaws.htm] **LEAD AGENCY/COLLABORATING AGENCIES:** Federal Aviation Administration (FAA) **LEAD AGENCY POINT OF CONTACT:** Kevin Young, ATO-E, 202-385-8502, kevin.young@faa.gov **POC:** Dan Strawbridge, FAA/ATO-T-SSE, 202-385-8671, dan.strawbridge@faa.gov

SERVICE AREA(S)/INITIATIVE (S)

• National Aviation Weather Initiatives: N/A

FUNDING

Programmed/Planned (\$'s/FY): /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION

Acquisition/Decision Support

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: a single-site system to address the unique severe weather patterns that adversely impact the Juneau, AK airport. All components of the JAWS system will be commercial-off-the-shelf products. The JAWS sensors will be placed at various locations in the Juneau area, including on top of mountains
- How will operations be changed/improved: JAWS will increase safety in the Juneau area by providing turbulence and wind shear alerts to pilot.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: N/A
- Program/Project verification process: N/A
- Method used for product validation: N/A
- Operational training for the user: N/A

- Next major program milestone: N/A
- *Program becomes operational:* Initial operating capability by end of CY 2005. Fully operational in FY06.
- Plans for further improvements: N/A

Polarization Algorithm (PA)

PROGRAM/PROJECT: Aviation Weather Research Program/Advanced Weather Radar Techniques Product Development Team [http://www.faa.gov/aua/awr/]

LEAD AGENCY/COLLABORATING AGENCIES: Federal Aviation Administration (FAA),/National Oceanic and Atmospheric Administration (NOAA)

LEAD AGENCY POINT OF CONTACT: Gloria Kulesa, FAA/AWRP, 202-267-7289, gloria.kulesa@faa.gov **PROGRAM POINT OF CONTACT:** Kim Elmore, NOAA/NSSL, 405-366-0458, kim.elmore@noaa.gov

SERVICE AREA(S)/INITIATIVE (S)

• National Aviation Weather Initiatives:

2: 5 **5:** 6

FUNDING

Programmed/Planned (\$'s/FY): /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: algorithms based on polarimetry which will provide information about the volumetric extent of hail, freezing rain, snow, and icing conditions, as well as non-hydrometeor scatterers.
- How will operations be changed/improved: the biggest potential payoff is enhanced data quality. Polarimetric techniques will eliminate problems associated with sea-clutter, ground clutter, AP, and biological scatterers.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Advanced Weather Radar Techniques Product Development Team Technical Direction and Seven Year Plan.
- Program/Project verification process: Monthly and quarterly reporting and program reviews. As part of the NEXRAD Product Improvement Program, PA is reviewed by the Technical Advisory Committee and the System Recommendation and Evaluation Committee.
- *Method used for product validation:* Developmental and operational testing.
- Operational training for the user: N/A

- Next major program milestone: Development of an algorithm specifically for discrimination between non-meteorological scatterers, including the ability to discriminate non-meteorological scatterers into chaff, avian, and insect categories.
- Program becomes operational: FY07
- *Plans for further improvements:* Investigate icing events and compare Polarimetric retrievals with model predictions and pilot reports.

Circulation Algorithm (CA)

PROGRAM/PROJECT: Aviation Weather Research Program/Advanced Weather Radar Techniques Product Development Team [http://www.faa.gov/aua/awr/]

LEAD AGENCY/COLLABORATING AGENCIES: Federal Aviation Administration (FAA)/National Oceanic and Atmospheric Administration (NOAA)

LEAD AGENCY POINT OF CONTACT: Gloria Kulesa, FAA/AWRP, 202-267-7289, gloria.kulesa@faa.gov **PROGRAM POINT OF CONTACT:** Kim Elmore, NOAA/NSSL, 405-366-0458, kim.elmore@noaa.gov

SERVICE AREA(S)/INITIATIVE (S)

National Aviation Weather Initiatives:
2: 5

FUNDING

Programmed/Planned (\$'s/FY): /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: More robust and reliable circulation detection algorithms to improve
 the diagnosis of storm severity and longevity and to mitigate the problem of high false alarm rates for
 controllers.
- How will operations be changed/improved: reduce false alarm rate and improve the diagnosis of storm severity and longevity.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Advanced Weather Radar Techniques Product Development Team Technical Direction and Seven Year Plan.
- *Program/Project verification process:* Monthly and Quarterly Reporting and Program Reviews. Review by the NEXRAD Technical Advisory Committee and the System Recommendation and Evaluation Committee.
- Method used for product validation: Developmental and operational testing.
- Operational training for the user: N/A

- Next major program milestone: NEXRAD Program Management Committee Technical Advisory Committee (TAC) meeting 1QFY05.
- Program becomes operational: FY06.
- Plans for further improvements: TBD

Multi-Radar Composites (MRC)

PROGRAM/PROJECT: Aviation Weather Research Program/Advanced Weather Radar Techniques Product Development Team [http://www.faa.gov/aua/awr/]

LEAD AGENCY/COLLABORATING AGENCIES: Federal Aviation Administration (FAA)/National Oceanic and Atmospheric Administration (NOAA)

LEAD AGENCY POINT OF CONTACT: Gloria Kulesa, FAA/AWRP, 202-267-7289, gloria.kulesa@faa.gov **PROGRAM POINT OF CONTACT:** Kim Elmore, NOAA/NSSL, 405-366-0458, kim.elmore@noaa.gov

SERVICE AREA(S)/INITIATIVE (S)

• National Aviation Weather Initiatives: N/A

FUNDING

• *Programmed/Planned* (\$'s/FY): /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: algorithms and techniques to develop and deliver a high-resolution 3D national radar mosaic that uses data from multiple radars. .
- How will operations be changed/improved: 3D gridded radar data will improve the initialization of numerical models resulting in improved analysis and forecast of aviation impact variables.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Advanced Weather Radar Techniques Product Development Team Technical Direction and Seven Year Plan.
- *Program/Project verification process:* Monthly and Quarterly Reporting and Program Reviews. Review by the NEXRAD Technical Advisory Committee and the System Recommendation and Evaluation Committee.
- *Method used for product validation:* Developmental and operational testing.
- Operational training for the user: N/A

- Next major program milestone: N/A
- Program becomes operational: FY 07
- *Plans for further improvements:* focus on scientific improvement of the national 3D mosaic including better quality control, gap-filling for "cone of silence" and data voids below the lowest beams, and the synchronization of multiple radar observations within the 3D mosaic.

Safe Flight 21 (SF-21) Capstone

PROGRAM/PROJECT: Safe Flight 21 [http://www1.faa.gov/and/and500/510/510-home.html]/Capstone [http://www.alaska.faa.gov/capstone/]

LEAD AGENCY/COLLABORATING AGENCIES: Federal Aviation Administration (FAA)

LEAD AGENCY POINT OF CONTACT:

PROGRAM POINT OF CONTACT: James McDaniel, AND-510, SF-21 Flight Safety Application Manager

SERVICE AREA(S)/INITIATIVE (S)

• National Aviation Weather Initiatives:

1: 2 2: 2 3: 3 5: 2 6: 2 7: 3 8: 2

FUNDING

• Programmed/Planned (\$'s/FY): /FY04

TYPE OF PROGRAM/APPLICATION

Acquisition/Decision Support

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: Alaska demonstration program using data link technology to uplink/downlink flight information (including weather) and traffic information to Part 135 and Part 91 aircraft.
- How will operations be changed/improved: providing weather, traffic, and terrain information to the cockpit will result in safer and more efficient flight operations.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: N/A
- Program/Project verification process: N/A
- Method used for product validation: N/A
- Operational training for the user: N/A

- Next major program milestone: N/A
- Program becomes operational: N/A
- Plans for further improvements: N/A

Stand Alone Weather Sensors (SAWS)

PROGRAM/PROJECT: Terminal Business Service [http://www2.faa.gov/aua/ipt_prod/weather/saws.htm] **LEAD AGENCY/COLLABORATING AGENCIES:** Federal Aviation Administration (FAA) **LEAD AGENCY POINT OF CONTACT:** Kevin Young, ATO-E, 202-385-8502, kevin.young@faa.gov **POC:** Dan Strawbridge, FAA/ATO-T-SSE, 202-385-8671, dan.strawbridge@faa.gov

SERVICE AREA(S)/INITIATIVE (S)

• National Aviation Weather Initiatives:

1: 7 **2:** 5 **4:** 2 **6:** 6

FUNDING

Programmed/Planned (\$'s/FY): /FY05 /FY06 FY/07

TYPE OF PROGRAM/APPLICATION

Acquisition/Decision Support

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: a system to serve as backup to ASOS at Service Level-C Air Traffic Control Towers, co-located Terminal Radar Approach Control facilities, and selected Automated Flight Service Stations. The SAWS sensor suite automatically collects, processes, and broadcasts surface weather data to air traffic controllers. Currently in the implementation phase with approximately 100 systems installed.
- How will operations be changed/improved: serve as backup to ASOS and replace aging sensors.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: N/A
- Program/Project verification process: N/A
- Method used for product validation: N/A
- Operational training for the user: N/A

- Next major program milestone: N/A
- *Program becomes operational:* All installations complete by end of FY09.
- Plans for further improvements: N/A

Volcanic Ash (VA)

PROGRAM/PROJECT: Aviation Weather Research Program/Oceanic Weather Product Development Team [http://www.rap.ucar.edu/projects/owpdt]

LEAD AGENCY/COLLABORATING AGENCIES: Federal Aviation Administration (FAA)/National Center for Atmospheric Research (NCAR), MIT/LL, Naval Research Laboratory, and the Aviation Weather Center **LEAD AGENCY POINT OF CONTACT:** Gloria Kulesa, FAA/AWRP, 202-267-7289, gloria.kulesa@faa.gov **PROGRAM POINT OF CONTACT:** Cathy Kessinger, NCAR/RAP, 303-497-8481, kessinger@ucar.edu

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: 8·1

FUNDING

• Programmed/Planned (\$'s/FY): /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION:

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: automated tools to ingest and decode current ash advisories and SIGMETs, represent these graphically, and broaden their availability and distribution through inclusion in a first-generation, graphical, web-based volcanic ash warning product.
- How operations will be changed/improved: Enhanced safety over oceanic and remote regions through high-resolution (space and time) alerting of hazard areas. Added ability to strategically plan around areas of volcanic ash at flight level.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Oceanic Weather Product Development Team Technical Direction and Seven Year Plan.
- Program/Project verification process: Monthly and quarterly reporting; program reviews; Research,
 Engineering, and Development Advisory Committee program assessments; science panel reviews; use of test
 beds for demonstrations and evaluations; Aviation Weather Technology Transfer Board decisions; and
 technical/human factors/user assessments.
- Method used for end product validation: TBD
- Operational training for the user: TBD

- Next major program milestone: Decision for experimental use 1QFY07.
- Program becomes operational: FY09 Plans for further improvements: TBD

Flight Level Winds (FLW)

PROGRAM/PROJECT: Aviation Weather Research Program/Oceanic Weather Product Development Team [http://www.rap.ucar.edu/projects/owpdt]

LEAD AGENCY/COLLABORATING AGENCIES: Federal Aviation Administration (FAA)/National Center for Atmospheric Research (NCAR), MIT/LL, Naval Research Laboratory, and the Aviation Weather Center **LEAD AGENCY POINT OF CONTACT:** Gloria Kulesa, FAA/AWRP, 202-267-7289, gloria.kulesa@faa.gov **PROGRAM POINT OF CONTACT:** Cathy Kessinger, NCAR/RAP, 303-497-8481, kessinger@ucar.edu

SERVICE AREA(S)/INITIATIVE(S)

National Aviation Weather Initiatives:
2: 10 3: 7 7:8 8:5

FUNDING

Programmed/Planned (\$'s/FY): /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION:

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: continue to exploit and expand on prior work done on spot winds derived from satellite data including IR, visible, and water vapor channels and explore the integration of derived 4-dimensional wind fields into future air traffic management systems.
- How operations will be changed/improved: improved winds needed for nowcasting convection, determining advection of volcanic ash, determining location and severity of clear air turbulence and convectively induced turbulence, traffic management decision support, and routine flight planning.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Oceanic Weather Product Development Team Technical Direction and Seven Year Plan.
- Program/Project verification process: Monthly and quarterly reporting; program reviews; Research,
 Engineering, and Development Advisory Committee program assessments; science panel reviews; use of test
 beds for demonstrations and evaluations; Aviation Weather Technology Transfer Board decisions; and
 technical/human factors/user assessments.
- Method used for end product validation: Compare results to observations.
- Operational training for the user: TBD

SCHEDULE/IMPLEMENTATION

• Next major program milestone: TBD

• Program becomes operational: TBD

Plans for further improvements: TBD

Appendix A-2 National Aeronautics and Space Administration (NASA)

NASA-1	DAT	Design and Analysis Tools
NASA-2	AIP	Aircraft Ice Protection
NASA-3	E&T	Education and Training
NASA-4	AWIN	Aviation Weather Information
NASA-4A	TAMDAR	Tropospheric Airborne Meteorological Detection and
		Reporting System
NASA-4B	AWARE	Aviation Weather Awareness and Reporting Enhancements
NASA-4C	WINN	Weather Information Network
NASA-4D	EWxR	Enhanced Weather Radar
NASA-4E	AHAS	Airborne Hazard Awareness System
NASA-4F	ASAP	Advanced Satellite Aviation Products
NASA-4G	E-PIREP	General Aviation Oriented Electronic Pilot Report
NASA-5	GIFTS	Geostationary Imaging Fourier Transform Spectrometer
NASA-6	SVS	Synthetic Vision System
NASA-7	TPAWS	Turbulence Prediction and Warning System
NASA-8	WINCOMM	Weather Information Communications

Design & Analysis Tools (DAT)

PROGRAM/PROJECT: Aircraft Icing Project [http://icebox-esn.grc.nasa.gov]

<u>LEAD AGENCY/COLLABORATING AGENCIES</u>: National Aeronautics and Space Administration (NASA), Federal Aviation Administration (FAA)

<u>LEAD AGENCY POINT OF CONTACT</u>: Mary Wadel, GRC, 216-977-7510, mary.f.wadel@nasa.gov <u>PROGRAM POINT OF CONTACT</u>: Mark Potapczuk, GRC, 216-433-3919, mark.g.potapczuk@nasa.gov

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: 5: 13

FUNDING

• *Programmed/Planned* (\$'s/FY): \$2050K/FY 05 /FY 06 /FY07

TYPE OF PROGRAM/APPLICATION

R&D/Prototype Demonstration

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: advanced icing simulation software, new experimental methods, and new experimental databases that will enable accurate evaluation of the performance of aircraft and aircraft sub-systems under icing conditions.
- *How will operations be changed/improved:* the tools developed from this element *will improve the design, testing, construction, and certification and qualification of aircraft and aircraft sub-systems.*

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Aircraft Icing Project Plan.
- *Program/Project verification process:* National Research Council reviews, peer reviews, and NASA Aircraft Icing Forums.
- Method used for end product validation: Technical peer reviews and experimental testing.
- *Operational training for the user:* Specific workshops when new tools are released and help from the Icing Research Branch as needed.

- Next major program milestone: Release of SmaggICE version 1.8
- *Program becomes operational:* The Design & Analysis Tools Element will develop enabling technologies to be implemented by industry, government agencies and academia.
- Plans for further improvements: The NASA Aviation Safety and Security Program is in the process of planning
 follow on activities. Potential follow on research areas related to the Design & Analysis Tools Element are
 incorporation of complex user-supplied algorithms into a single icing simulation product utilizing modular,
 component-based design concepts; complete scaling effects study of ice accretion on aircraft aerodynamics;
 continued development of experimental methods and databases for super-cooled large droplets (SLD); extend
 ice shape scaling methods to SLD conditions; understand the effect of ice on aircraft control surfaces and the
 resulting effect on aircraft dynamics.

Aircraft Ice Protection (AIP)

PROGRAM/PROJECT: Aircraft Icing Project [http://icebox-esn.grc.nasa.gov]

LEAD AGENCY/COLLABORATING AGENCIES: National Aeronautics and Space Administration (NASA), Federal Aviation Administration (FAA), National Oceanic and Atmospheric Administration (NOAA), and the Department of Defense (DoD)

<u>LEAD AGENCY POINT OF CONTACT</u>: Mary Wadel, GRC, 216-977-7510, mary.f.wadel@nasa.gov **PROGRAM POINT OF CONTACT**: Andrew Reehorst, GRC, 216-433-3938, andrew.l.reehorst@nasa.gov

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives: 5: 11

FUNDING

• *Programmed/Planned* (\$'s/FY): \$190K/FY 05 **\$K**/FY 06 **\$K**/FY07

TYPE OF PROGRAM/APPLICATION

R&D/Prototype Demonstration

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: (1) remote sensing technologies to measure icing conditions; (2) systems to monitor and assess aircraft performance; and (3) instrumentation and measurement techniques to characterize atmospheric icing conditions.
- How will operations be changed/improved: developments will improve safety, assist in avoidance of icing conditions, and promote improved aircraft certification guidelines.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Aircraft Icing Project Plan.
- *Program/Project verification process:* National Research Council reviews, peer reviews, and NASA Aircraft Icing Forums.
- Method used for end product validation: Technical peer reviews and experimental testing.
- *Operational training for the user:* None is expected.

- Next major program milestone: Remote sensing ground-based prototype tests
- *Program becomes operational:* The Aircraft Ice Protection Element will develop enabling technologies to be implemented by industry, government agencies and academia.
- *Plans for further improvements:* The NASA Aviation Safety and Security Program is in the process of planning follow on activities. Potential follow on research areas related to the Aircraft Ice Protection Element are ground-based remote sensing field test, flight datalink for icing information, super-cooled large droplet instrumentation technologies.

Education & Training (E&T)

PROGRAM/PROJECT: Aircraft Icing Project [http://icebox-esn.grc.nasa.gov]

<u>LEAD AGENCY/COLLABORATING AGENCIES</u>: National Aeronautics and Space Administration (NASA), Federal Aviation Administration (FAA)

<u>LEAD AGENCY POINT OF CONTACT</u>: Mary Wadel, GRC, 216-977-7510, mary.f.wadel@nasa.gov <u>PROGRAM POINT OF CONTACT</u>: Thomas Bond, GRC, 216-433-3900, thomas.h.bond@nasa.gov

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: 5: 5. 12

FUNDING

• *Programmed/Planned (Net \$'s/FY):* \$300K/FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION

R&D/Prototype Demonstration

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: in-flight icing related training materials such as videos, computer based training modules, lecture series, and web-based materials. The Education & Training Element is focused on developing materials that support knowledge about in-flight icing, the basic concepts of icing weather, icing operations, and the impact of ice on the aircraft.
- How will operations be changed/improved: will improve knowledge about in-flight icing and will contribute to safe operations in and avoidance of icing conditions.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Aircraft Icing Project Plan
- *Program/Project verification process:* National Research Council reviews, peer reviews, and NASA Aircraft Icing Forums.
- *Method used for product validation:* Reviews by pilot organizations, safety foundations, airline operators, and operational readiness reviews
- Operational training for the user: The products from this element are specifically directed to be used as
 educational and training materials via text materials, classroom instruction, distance learning, and self-paced
 instruction.

- Next major program milestone: Icing for Turbine Aircraft Pilots training materials
- *Program becomes operational:* The products are operational when released.
- Plans for further product improvements: The NASA Aviation Safety and Security Program is in the process of planning follow on activities. Potential follow on research areas related to the Education & Training Element are developing realistic icing training environments concepts, integration of icing training into other aviation weather hazards, and more use of web-based dissemination methods.

Aviation Weather Information (AWIN)

PROGRAM/PROJECT NAME: Aviation Safety and Security Program/Weather Accident Prevention Sub-Project [http://wxap.grc.nasa.gov/awin]

LEAD AGENCY/COLLABORATING AGENCIES: National Aeronautics and Space Administration (NASA),

Federal Aviation Administration (FAA), National Oceanic and Atmospheric Administration (NOAA)

LEAD AGENCY POC: Gus Martzaklis, GRC, 216-433-8966, Konstantinos. S. Martzaklis @nasa.gov

PROGRAM POC: Paul Stough, LaRC, 757-864-3860, h.p.stough@ nasa.gov

SERVICE AREA/INITIATIVE

• National Aviation Weather Initiatives:

1: 6 2: 3 3: 1, 4 5: 1, 3 6: 3 7: 2, 4 8: 1, 4

FUNDING

• *Programmed/Planned (Net \$'s/FY)*: \$3.625M/FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: Guidelines for the display of weather information in the cockpit; enhanced cockpit display products incorporating in-situ and remotely sensed data, enhanced presentations, and decision aids. Research is addressing both transport and GA operations.
- How will operations be changed/Improved: Improves weather situation awareness of pilots in flight, aids decision making related to weather, and assists in the reduction of aircraft accidents attributable to weather. Operators may see added benefit of fuel savings through more efficient strategic avoidance of hazardous weather.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this Program/Project: AvSP/WxAP/AWIN Level III Plan.
- Program/project verification process: Weather Accident Prevention Project Reviews, NRC Review, Industry Review.
- Method used for end product validation: Evaluate technologies through system or subsystem models or
 prototypes in a relevant environment.
- *Operational training for the user:* AWIN will identify training needs and guidelines to support use of weather information technologies.

- *Next major program milestoneFY 2005 is the final year of WxAP*. AWIN technologies will be evaluated along with turbulence prediction and warning technologies in B-747 simulator at NASA Ames.
- *Program becomes operational:* AWIN develops enabling technologies that need to be implemented by industry or other government agencies. Commercial AWIN systems became available during 2002 and 2003.
- Plans for further improvement: With the fielding of first-generation AWIN systems, NASA is focusing on
 development of next-generation technologies to improve use of data-link weather information with other more
 conventional cockpit weather information sources, to develop means for trending of data, and to aid weatherrelated decision-making by flight crews.

Tropospheric Airborne Meteorological Data Reporting (TAMDAR) System

PROGRAM/PROJECT: Aviation Safety and Security Program/Weather Accident Prevention Sub-Project [http://awin.larc.nasa.gov/tamdar_abs1.htm]

<u>LEAD AGENCY/COLLABORATING AGENCIES:</u> National Aeronautics and Space Administration (NASA), Federal Aviation Administration (FAA), NOAA Forecast Systems Lab (FSL), NOAA National Centers for Environmental Prediction (NCEP), and NOAA National Weather Service (NWS).

LEAD AGENCY POINT OF CONTACT: Gus Martzaklis, GRC, 216-433-8966,

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<u>PROGRAM POINT OF CONTACT:</u> Taumi Daniels, LaRC, 757-864-4659, t.s.daniels@larc.nasa.gov; Paul Stough, LaRC, 757-864-3860, h.p.stough@larc.nasa.gov, James Ladd, AirDat, 919-653-4350, jladd@airdat.com

SERVICE AREA(S)/INITIATIVE (S)

• *National Aviation Weather Initiatives:* 3: 2, 5, 6 5: 4, 6, 9 7:1

FUNDING

• *Programmed/Planned* (\$'s/FY): **800K**/FY05 **0**/FY06 **0** /FY07

TYPE OF PROGRAM/APPLICATION:

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: A sensor package for aircraft flying below 25,000 feet to measure temperature, pressure altitude, relative humidity, wind speed and direction, turbulence, and ice accretion.
- *How will operations be changed/improved:* Data will be automatically transmitted to the ground for use in weather analyses and forecasts.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: NASA AvSSPP/WxAP/AWIN Level III Plan; NASA/FAA/NOAA
 Operational Concepts for Applications of Aircraft Derived Meteorological Information.
- Program/Project verification process: Weather Accident Prevention Project Reviews, NRC Review, Industry Review, NASA-FAA-NOAA Tri-Agency Coordination Team.
- *Method used for product validation:* Utilize ground test facilities and instrumented aircraft to conduct ground and flight tests for sensor verification.
- Operational training for the user: TBD

- *Next major program milestone*: 2005 In-Service Evaluation to test end-to-end system with regional airline in Great Lakes region; ingest data into RUC forecast model; use data to generate local forecasts.
- Program becomes operational: 2005 AirDat to equip other regional airlines and package carriers.
- *Plans for further improvements:* Human Factors research for cockpit display of TAMDAR data. New aviation weather products from TAMDAR data. Aircraft specific conversion of TAMDAR icing and turbulence data.

Aviation Weather Awareness and Reporting Enhancements (AWARE)

PROGRAM/PROJECT: Aviation Safety Program/Weather Accident Prevention Project **LEAD AGENCY/COLLABORATING AGENCIES:** National Aeronautics and Space Administration (NASA), Federal Aviation Administration (FAA), National Oceanic and Atmospheric Administration (NOAA), and a Cooperative Research Agreement (CRA) with Rockwell.

<u>PROGRAM POINT OF CONTACT</u>: Gus Martzaklis, GRC, 216-433-8966, kmartzaklis@grc.nasa.gov <u>LEAD AGENCY POINT OF CONTACT</u>: Paul Stough, LaRC, 757-864-3860, h.p.stough@larc.nasa.gov

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives: N/A

FUNDING

• Programmed/Planned (\$'s/FY): FY04 FY05

TYPE OF PROGRAM/APPLICATION

R&D

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: technologies and prototype to enable display and briefing of flight plan relevant graphical and text-based weather information, and decision support tools to advise pilot of probability of mission success based on pilot preferences, risk tolerance, and aircraft equipage (advisory only).
- How will operations be changed/improved: improvements in pre-flight weather briefings, particularly for General Aviation pilots, consisting of flight plan relevant information and decision support aids, will lead to improved pilot situational awareness.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: WxAP Project Plan.
- Program/Project verification process: NASA sponsored annual Weather Accident Prevention reviews, Aviation Safety Program Executive Council reviews, and reviews/audits at the project/element level.
- Method used for end product validation: Combination of (a) system-level modeling and simulations, (b)
 laboratory-based experiments and (c) flight experiments via appropriate industry and/or NASA research aircraft.
 Many of these validation efforts are performed under cost-shared cooperative research agreements with industry.
- *Operational training for the user:* Training guidance for the use of new graphical weather pre-flight briefings will be developed in conjunction with the AvSP System Wide Accident Prevention (SWAP) project.

- *Next major program milestone:* AWARE was completed. Technologies to be integrated into the Airborne Hazard Awareness System (AHAS).
- Program becomes operational: N/A
- Plans for further improvements: N/A

Weather Information Network (WINN)

PROGRAM/PROJECT: Aviation Safety Program/Weather Accident Prevention Project **LEAD AGENCY/COLLABORATING AGENCIES**: National Aeronautics and Space Administration (NASA) and Honeywell under a Cooperative Research Agreement (CRA).

PROGRAM POINT OF CONTACT: Gus Martzaklis, GRC, 216-433-8966, kmartzaklis@grc.nasa.gov **LEAD AGENCY POINT OF CONTACT**: Paul Stough, NASA/LaRC, 757-864-3860, h.p.stough@larc.nasa.gov

SERVICE AREA(S)/INITIATIVE(S)

National Aviation Weather Initiatives: N/A

FUNDING

• *Programmed/Planned* (\$'s/FY): FY04 FY05

TYPE OF PROGRAM/APPLICATION:

R&D

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: a cockpit display and communications capability to deliver near realtime ground-based graphical weather products and other beneficial information to the cockpit and to the Airline Operation Centers.
- How operations will be changed/improved: The commercial airline flight crew will have on-demand access to aviation weather information and updates, and automatic access to hazardous weather alerts as they are generated.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Honeywell/NASA CRA, contracts with team participants, WxAP Project Plan.
- *Program/Project verification process:* Internal design reviews, customer formal and informal, simulator and revenue aircraft, evaluations and associated reports, quarterly reviews with NASA.
- *Method used for end product validation:* Demonstration/evaluation during in-service evaluations (ISE) on revenue airline flights and flight simulators, ISE on NASA B-757 flight-test aircraft.
- *Operational training for the user:* Hands-on classroom, operator's manual, ground-based network version for training, jump seat trained instructors.

- *Next major program milestone:* WINN CRA completed in November 2002. Capability to be included in Honeywell's Epic line of avionics.
- When program will become operational: N/A
- Plans for further improvements: N/A

Enhanced Weather Radar (EWxR)

PROGRAM/PROJECT: Aviation Safety Program/Weather Accident Prevention Project **LEAD AGENCY/COLLABORATING AGENCIES:** National Aeronautics and Space Administration (NASA), Federal Aviation Administration (FAA), National Oceanic and Atmospheric Administration (NOAA), Department of Defense (DoD)

PROGRAM POINT OF CONTACT: Gus Martzaklis, GRC, 216-433-8966, kmartzaklis@grc.nasa.gov **LEAD AGENCY POINT OF CONTACT:** Paul Stough, LaRC, 757-864-3860, h.p.stough@larc.nasa.gov

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives: N/A

FUNDING

• Programmed/Planned (\$'s/FY): FY04 FY05

TYPE OF PROGRAM/APPLICATION

R&D

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: technologies and prototype to enable display of combined up-linked and on-board sensed graphical weather radar information in transport cockpits. .
- How will operations be changed/improved: combined data from diverse weather sources will provide a complete weather picture including information sensed in the near-vicinity of the aircraft, leading to improved pilot situational awareness and allowing collaborative decision making between pilots, ATC, and AOC's.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: WxAP Project Plan.
- *Program/Project verification process:* NASA sponsored annual Weather Accident Prevention reviews, Aviation Safety Program Executive Council reviews, and reviews/audits at the project/element level.
- *Method used for end product validation:* Combination of (a) system-level modeling and simulations, (b) laboratory-based experiments and (c) flight experiments via appropriate industry and/or NASA research aircraft. Many of these validation efforts are performed under cost-shared cooperative research agreements with industry partners.
- Operational training for the user: Training guidance for the use of new graphical weather information technologies will be developed in conjunction with the AvSP System Wide Accident Prevention (SWAP) project.

- *Next major program milestone:* EWxR activity completed. Technologies to be integrated into the Airborne Hazard Awareness System (AHAS).
- Program becomes operational: N/A
- Plans for further improvements: N/A

Airborne Hazard Awareness System (AHAS)

PROGRAM/PROJECT: Aviation Safety and Security Program/Weather Accident Prevention Sub-Project [http://awin.larc.nasa.gov/ahas_abs1.htm]

LEAD AGENCY/COLLABORATING AGENCIES: National Aeronautics and Space Administration (NASA) **LEAD AGENCY POINT OF CONTACT:** Gus Martzaklis, GRC, 216-433-8966,

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PROGRAM POINT OF CONTACT: Jon Jonsson, LaRC, 757-864-2001, Jon.E.Jonsson@nasa.gov; Mary Beth Lapis, Rockwell Collins, 319-295-3045, mblapis@collins.rockwell.com; Paul Stough, LaRC, 757-864-3860, H.P.Stough@nasa.gov

SERVICE AREA(S)/INITIATIVE (S)

• National Aviation Weather Initiatives:

1: 6 **2**: 3 **3**: 4 **5**: 3 **6**: 3 **7**: 4 **8**: 4

FUNDING

Programmed/Planned (\$'s/FY): \$300K /FY05 /FY06 FY/07

TYPE OF PROGRAM/APPLICATION:

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: A prototype AWIN system is being developed that provides capabilities to combine weather information from various sources, including on-board sensors and datalinks, and to display graphical weather information to the pilot. AHAS can automatically parse text and weather data, convert it to graphics, evaluate both tactical and strategic hazards in the weather data stream, and provide alerts to pilots. AHAS currently supports primarily WxAP AWIN transport research, but has been used for GA purposes.
- How will operations be changed/improved: AHAS technologies should improve situational awareness of flight
 crews for better hazard avoidance and en route weather decision-making that may also provide airline fuel cost
 savings.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: AWIN Level III Plan.
- Program/Project verification process: Weather Accident Prevention Project Reviews, NRC Review, and Industry Review.
- *Method used for product validation:* Simulation and flight experiments.
- *Operational training for the user:* Training issues will be identified as a consequence of simulation and flight experiments.

- *Next major program milestone:* AHAS will be evaluated in conjunction with turbulence prediction and warning technologies in a commercial jet transport environment using the NASA Ames B-757 simulator.
- Program becomes operational: NASA will rely on industry to commercialize AHAS technologies.
- Plans for further improvements: WxAP ends in FY 2005. Evolution of AHAS could potentially include integration of TAMDAR-derived products, terrain/traffic, "three-dimensional" weather displays, and tactical/terminal-areas products.

Advanced Satellite Aviation-weather Products (ASAP)

PROGRAM/PROJECT: Aviation Safety and Security Program/Weather Accident Prevention Sub-Project **LEAD AGENCY/COLLABORATING AGENCIES:** National Aeronautics and Space Administration (NASA), Federal Aviation Administration (FAA), and National Weather Service (NWS)

LEAD AGENCY POINT OF CONTACT: Gus Martzaklis, GRC, 216-433-8966,

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PROGRAM POINT OF CONTACT: John Murray, LaRC, 757-864-5883, John.J.Murray@nasa.gov; Paul Stough, LaRC, 757-864-3860, h.p.stough@nasa.gov

SERVICE AREA(S)/INITIATIVE (S)

• National Aviation Weather Initiatives:

2: 9 **3**: 6 **5**: 11 **7**: 12 **8**: 7

FUNDING

• *Programmed/Planned* (\$'s/FY): \$1.9M/FY05 /FY06 /FY07

Note: R&D is jointly funded by the Aviation Safety Program and NASA's Earth Science Applications Division.

TYPE OF PROGRAM/APPLICATION

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: Technologies are being developed to enable use of current and nextgeneration satellite data to improve aviation weather products. Technology will be used in the FAA Aviation Weather Research Program (AWRP) for product development. Feasible products include convection, turbulence, icing, volcanic ash, and winds.
- **How will operations be changed/improved:** Better aviation forecasts and weather hazard information will lead to improved safety and efficiency within the National Airspace System.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: AWIN Level III Plan.
- *Program/Project verification process:* Weather Accident Prevention Project Reviews, NRC Review, Industry Review, FAA AWRP reviews and Aviation Weather Technology Transfer (AWTT) process.
- Method used for product validation: AWTT process.
- Operational training for the user: TBD

- Next major program milestone: Working with the FAA AWRP Oceanic Weather Product Development Team, to deliver satellite-based convective initiation fields in FY2005 that are needed to produce a prototype FAA oceanic convective weather product.
- *Program becomes operational:* NASA will rely on FAA and NWS to implement technologies in new weather products.
- *Plans for further improvements:* Initial effort focusing on use of existing satellite data; future work will prepare for use of data from next-generation high-resolution satellite sounders.

General Aviation Oriented Electronic Pilot Report (E-PIREP) Generation and Datalink System

PROGRAM/PROJECT: Aviation Safety Program/Weather Accident Prevention Project [http://awin.larc.nasa.gov/e-pirep_abs1.htm]

LEAD AGENCY/COLLABORATING AGENCIES: National Aeronautics and Space Administration (NASA), Federal Aviation Administration (FAA), and the National Weather Service (NWS).

LEAD AGENCY POINT OF CONTACT: Gus Martzaklis, GRC, 216-433-8966,

Konstantinos.S.Martzaklis@nasa.gov

PROGRAM POINT OF CONTACT: Taumi Daniels, LaRC, 757-864-4659, t.s.daniels@larc.nasa.gov; Paul Stough, LaRC, 757-864-3860, h.p.stough@larc.nasa.gov.

SERVICE AREA(S)/INITIATIVE (S)

• National Aviation Weather Initiatives: N/A See NASA-6A

FUNDING

• Programmed/Planned (\$'s/FY): FY04 FY05

TYPE OF PROGRAM/APPLICATION:

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: a system for the automatic reporting (E-PIREP) of weather information from general aviation aircraft via VHF data link (VDML).
- **How will operations be changed/improved:** Such applications include both real-time sharing of data between equipped aircraft, and inclusion of E-PIREP data into weather analysis, modeling, and forecasting processes to create more accurate predictions of hazardous conditions.

PROGRAM/PROJECT MANAGEMENT

Basic guidance document for this program: N/A

Program/Project verification process: N/A

• Method used for product validation: N/A

• Operational training for the user: N/A

- *Next major program milestone:* This cooperative research effort with industry partner Honeywell completed Phase I of activity. Honeywell chose not to pursue Phase II.
- *Program becomes operational:* Program activity was superseded by in-house effort called Tropospheric Airborne Meteorological Data Reporting (TAMDAR).
- Plans for further improvements: N/A

Geostationary Imaging Fourier Transform Spectrometer (GIFTS)

PROGRAM/PROJECT:

LEAD AGENCY/COLLABORATING AGENCIES: National Aeronautics and Space Administration (NASA), National Oceanic and Atmospheric Administration (NOAA)

<u>LEAD AGENCY POINT OF CONTACT</u>: Lou Schuster, NASA HQ, 202-358-0772, lschuste@mail.hq.nasa.gov <u>PROGRAM POINT OF CONTACT</u>: Dr. Robert A. Reisse, LaRC, 757-864-9852, Robert.A.Reisse@nasa.gov

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives: 3: 6

FUNDING

• *Programmed/Planned* (\$'s/FY): / FY 05 / FY06 /FY07

TYPE OF PROGRAM/APPLICATION

Engineering Development Demonstration - Benefit to HES/GOES-R

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: new technologies for measuring altitude-resolved winds and temperatures from geostationary orbit. Technologies include a Michelson interferometer, large area detector arrays, high speed analog-to-digital conversion systems, and light weight optics and structures.
- How will operations be changed/improved: High- resolution wind and temperature measurements will enhance numerical weather prediction and improve flight safety and efficiency.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: NA
- Program/Project verification process: Normal series of reviews (PDR, MCR, CDR) in accordance with NASA 7120.4A.
- Method used for end product validation: Evaluation of Calibration Data.
- *Operational training for the user:* Not applicable.

- Next major program milestone: NA
- *Program becomes operational:* This program is not intended to become operational. It's a demonstration of a new measurement concept for water vapor winds. The first operational system scheduled to be flown on GOES R in the 2010-2012 timeframe.
- Plans for further improvements: Technology to be infused into the NOAA Advanced Baseline Sounder Program.

Synthetic Vision System (SVS)

PROGRAM/PROJECT: Aviation Safety Program

LEAD AGENCY/COLLABORATING AGENCIES: National Aeronautics and Space Administration (NASA) **LEAD AGENCY POINT OF CONTACT:** George Finelli, LaRC, 757-864-9100, <g.b.finelli@larc.nasa.gov> **PROGRAM POINT OF CONTACT:** Dan Baize, LaRC, 757-864-1071, <d.g.baize@larc.nasa.gov>

SERVICE AREA (S)/INITIATIVE (S)

National Aviation Weather Initiatives:
 1: 14

FUNDING

• *Programmed/Planned (Net \$'s/FY):* /FY 05 /FY 06 /FY 07

TYPE OF PROGRAM/APPLICATION

R&D/Decision Support

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: a display of terrain and other airport surface features to provide guidance cues and enhance airport surface awareness. The SVS Project will develop and demonstrate display configurations, display concepts, and enabling technologies.
- How will operations be changed/improved: Eliminates low visibility conditions as a causal factor to civil aircraft accidents. In addition, SVS will increase National Airspace System efficiency by allowing operations to more runways and to lower weather minimums.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: SVS Project Plan, dated November 28, 2001.
- *Program/Project verification process:* The SVS Project participates in annual independent reviews and in reviews by the Aviation Safety Program's Executive Council.
- *Method used for end product validation:* The Office of Mission Assurance will provide support to the SVS Project in the areas of systems safety, reliability, quality assurance and environmental impact. Analyses will be prepared in order to develop a safety information package to provide to industry partners to facilitate or expedite their certification of the technology. Technologies are also validated using simulations and flight tests.
- *Operational training for the user:* Industry will be responsible for setting training standards for their final, certified products.

- Next major program milestone: 1QFY04- Initial air transport flight evaluation using SVS display concepts integrated with runway incursion prevention concepts.
- *Program becomes operational:* The SVS Project develops enabling technologies that must be implemented by industry or other government agencies. The current research and technology project is funded through FY 05. Operations in air transport aircraft probably at least five years away.
- *Plans for further improvements:* Consider advanced display media and other second-generation SVS technologies that will be flyable and navigable.

Turbulence Prediction and Warning Systems (TPAWS)

PROGRAM/PROJECT: Aviation Safety and Security Program/Weather Accident Prevention Sub-Project [http://tpaws.larc.nasa.gov]

LEAD AGENCY: National Aeronautics and Space Administration (NASA)

LEAD AGENCY POINT OF CONTACT: Gus Martzaklis, GRC, 216-433-8966,

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PROGRAM POINT OF CONTACT: Jim Watson, LaRC, 757-864-6985, James.F.Watson@nasa.gov Rod Bogue, DFRC, 661-276-3193, Rod.Bogue@nasa.gov,

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives:

7: 7, 9

FUNDING

• *Programmed/Planned (\$'s/FY)*: \$2.5M/FY 05 \$0/FY 06 \$0/FY07

TYPE OF PROGRAM/APPLICATION

R&D/Decision Support

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: Onboard systems technologies development to detect turbulence, provide warning and mitigate its impacts. Testing is underway to identify performance of technologies in the relevant atmospheric environment and test techniques and criteria are being explored for use in the eventual hardware certification process by the FAA. Technologies include Light Detection and Ranging (LIDAR), enhanced onboard radar (RADAR), and Turbulence AutoPIREP System (TAPS).
- How will operations be changed/improved: Early detection of flight path turbulence, and awareness of existing
 near-by turbulence encounters, to reduce the risk of turbulence-induced injury or death by providing timely
 warning of impending turbulence encounters.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Weather Accident Prevention Project Level II Plan.
- Program/Project verification process: Annual Weather Accident Prevention Project reviews.
- *Method used for end product validation:* Flight testing in a relevant atmospheric environment and In Service Evaluations with major airline.
- *Operational training for the user:* NASA is addressing certification issues with the FAA. User training will be developed by In-Service-Evaluations and when the technologies are transitioned to full operational use.

- *Next major program milestone:* In-Service-Evaluation of Enhanced Turbulence Radar <pre-production prototype> with a major airline, and In-Service-Evaluation of TAPS on major airline fleet, both in FY05.
- *Program becomes operational:* TPAWS develops technologies that will be implemented by avionics/airline operations industry or government agencies.
- *Plans for further improvements:* Production units will be manufactured by avionics manufacturers for new/retrofit equipment for airline fleets.

Weather Information Communications (WINCOMM)

PROGRAM/PROJECT: Aviation Safety and Security Program/Weather Accident Prevention Project [http://wxap.grc.nasa.gov/wincomm]

LEAD AGENCY/COLLABORATING AGENCIES: National Aeronautics and Space Administration (NASA)/ Federal Aviation Administration (FAA), National Oceanic and Atmospheric Administration (NOAA), Department of Defense (DoD)

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PROGRAM POC: Michael Jarrell, GRC, 216-433-8102, michael.a.jarrell@nasa.gov

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives:

1: 2 2: 2 3: 3 5: 2 6: 2 7: 3 8: 2

FUNDING

• *Programmed/Planned (\$'s/FY):* 1.698M (net)/FY 05

TYPE OF PROGRAM/APPLICATION

R&D/Product Dissemination

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: optimize air-to-air and air-to-ground data link technologies such as UAT, VDLM2/3, and Mode S to enable the transmission of weather information to the cockpit. WINCOMM will define communication requirements, assess the current communications infrastructure, and apply/develop technologies to satisfy gaps.
- How will operations be changed/improved: new communications technologies will provide a capability to uplink weather information to pilots in the cockpit, increase situational awareness, and assist in the reduction of aircraft accidents attributable to weather.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: WINCOMM Level III Element Plan.
- *Program/Project verification process:* NASA sponsored annual Weather Accident Prevention reviews, Aviation Safety Program Executive Council reviews, and reviews/audits at the project/element level.
- *Method used for end product validation:* Combination of (a) system-level modeling and simulations, (b) laboratory-based experiments and (c) flight experiments via appropriate industry and/or NASA research aircraft. Many of these validation efforts are performed under cost-shared cooperative research agreements with industry partners.
- *Operational training for the user:* Not applicable since datalink technologies are generally not end-user devices requiring training.

- *Next major program milestone:* 4QFYO4 Initial lab evaluation of next-generation weather datalink technologies. 1QFY05 Final flight test plan. 3QFY05 Flight evaluation of developed datalink technologies.
- *Program becomes operational:* WINCOMM develops enabling technologies that need to be implemented by partners within industry or other government agencies.
- *Plans for further improvements:* Proposed post-FY05 work under consideration builds upon successes by leveraging broad user-base commercial technologies for required increased capacity and lower cost for weather dissemination for the aviation community to further increase safety benefits and encourage voluntary equipage.

Appendix A-3 National Oceanic and Atmospheric Administration (NOAA)

NOAA-1	AIP	Aircraft Icing Product
NOAA-2	ASOS	Automated Surface Observing System
NOAA-3	LCP	Low Cloud Product
NOAA-4	NLDN	National Lightning Detection Network
NOAA-5	VAFTAD	Volcanic Ash Forecast Transport and Dispersion Model
NOAA-6	VAG	Volcanic Ash Graphic
NOAA-7	VAP	Volcanic Ash Product
NOAA-8	WGPP	Wind Gust Potential Product
NOAA-9	WRF	Weather and Research Forecast Model
NOAA-10	IRaDS	Integrated Radar Data Services
NOAA-11	MMCR	Millimeter Cloud Radar
NOAA-12	PACE	Prototype Aviation Collaborative Effort
NOAA-13	PTI	Pilot Training Initiative
NOAA-14	AOC	Aviation Operations Course
NOAA-15	HYSPLIT	Hybrid Single Particle Lagrangian Integrated Trajectory Model
NOAA-16	TAF	Terminal Area Forecast
NOAA-17	CCFP	Collaborative Convective Forecast Product
NOAA-18	GFA	Graphical Forecast for Aviation
NOAA-19	DLAC	Distance Learning Aviation Course

Aircraft Icing Product (AIP)

PROGRAM/PROJECT: Satellite Meteorology and Climatology Division,

[http://www.orbit.nesdis.noaa.gov/smcd/opdb/aviation/icg.html]

<u>LEAD AGENCY</u>: National Oceanic and Atmospheric Administration (NOAA), National Environmental Satellite, Data, and Information Service (NESDIS)

<u>LEAD AGENCY POINT OF CONTACT</u>: Mitch Goldberg, NESDIS, 301-763-8078, mitch.goldberg@noaa.gov <u>PROGRAM POINT OF CONTACT</u>: Gary Ellrod, NESDIS, 301-763-8204 ext 140, gary.ellrod@noaa.gov

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives: 5: 1

FUNDING

Programmed/Planned (\$'s/FY): /FY 05 /FY 06 /FY 07
 \$20 K
 NF
 NF

TYPE OF PROGRAM/APPLICATION

• R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: Multi-spectral IR GOES product depicting areas of potential icing from Imager and approximate altitudes from Sounders (Icing Enhanced Cloud-top Altitude Product (ICECAP).
- *How will operations be changed/improved:* The new product will provide forecasters with additional guidance to help improve warnings and short range forecasts of in-flight icing.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Office of Research and Applications (ORA) Research Project Plan.
- Program/Project verification process: GOES Improved Measurement Product Assurance Plan reviews.
- *Method used for end product validation:* Comparison with aircraft pilot reports by means of NOAA/FSL's Real-Time Verification System (RTVS). Reports from individual forecast offices or other users.
- Operational training for the user: Periodic workshops sponsored by National Weather Service (NWS), Cooperative Program for Operational Meteorology, Education and Training (COMET), National Weather Association (NWA), and the American Meteorological Society (AMS). Distance learning modules.

- *Next major program milestone:* Inclusion of merged icing/cloud top product (ICECAP) in RTVS (NESDIS funding requested)
- *Program becomes operational:* TBD. Product is experimental, but could become available for operational implementation after FY06 if funding is available and product is officially requested. Dependant on NWS requirements and AWIPS Build schedules.
- *Plans for further improvements:* None planned.

Automated Surface Observing System (ASOS)

{PRIVATE }

PROGRAM/PROJECT: ASOS product improvements. [http://www.nws.noaa.gov/asos]

LEAD AGENCY/COLLABORATING AGENCIES: National Oceanic and Atmospheric Administration

(NOAA), Federal Aviation Administration (FAA), Department of Defense (DoD)

<u>LEAD AGENCY POINT OF CONTACT</u>: Lee Stang, NWS (Program Management Branch Chief), 301-713-9001 ext 101, lee.stang@noaa.gov

PROGRAM POINT OF CONTACT: Rick Ahlberg, NWS (ASOS PI Manager), 301-713-1975 ext 160, richard.ahlberg@noaa.gov

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives:

1: 7 **2:** 5 **4:** 2 **6:** 6

FUNDING

Programmed/Planned (\$'s/FY): \$12M /FY 05 \$12M /FY 06 \$16M /FY07 \$16M /FY08

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: upgrades to the ACU processor, all-weather precipitation accumulation gauge, ice-free wind sensor, dew point sensor, precipitation identifier, ceilometer, and improved freezing precipitation algorithm and ceiling/visibility reporting
- How will operations be changed/improved: increased reliability, reduced maintenance, and better observations to support aircraft operations

{PRIVATE }PROGRAM/PROJECT MANAGEMENT {tc \l 1 "PROGRAM/PROJECT MANAGEMENT "}

- Basic guidance document for this program: ASOS specifications and requests for change.
- Program/Project verification process: Preliminary and Critical Design Reviews, Functional and Physical Configuration Audits. The ASOS Program Management Committee and the ASOS Configuration Control Board provide oversight.
- *Method used for end product validation:* Component, Integration, System and Acceptance Testing including Operational Acceptance Tests.
- *Operational training for the user:* Installation Instructions; Updates to Maintenance Manuals, Software Documentation, and Training Materials and Courses.

- *Next major program milestone:* Complete ACU processor upgrade and dew point sensor deployment in June 2005. Complete all-weather precipitation accumulation gauge deployment in March 2005. Complete operational testing of new "ice free" wind sensor in October 2004. Full-scale deployment of new wind sensor will begin in December 2004 and extend through December 2005. Complete development of enhanced precipitation identifier in March 2005, complete operational testing in September 2005.
- *Program becomes operational:* ASOS is an operational system. Product improvements will continue through the FY 09 timeframe.
- Plans for further improvements: Additional capabilities for sunshine duration and snow depth.

Low Cloud Product (LCP)

PROGRAM/PROJECT: Satellite Meteorology and Climatology Division (SMCD),

[http://www.orbit.nesdis.noaa.gov/smcd/opdb/aviation/fog.html]

<u>LEAD AGENCY</u>: National Oceanic and Atmospheric Administration (NOAA), National Environmental Satellite, Data, and Information Service (NESDIS)

<u>LEAD AGENCY POINT OF CONTACT</u>: Mitch Goldberg, NESDIS, 301-763-8078, mitch.goldberg@noaa.gov <u>PROGRAM POINT OF CONTACT</u>: Gary Ellrod, NESDIS, 301-763-8204 ext 140, gary.ellrod@noaa.gov

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives:

1: 1, 5

FUNDING

• *Programmed/Planned* (\$'s/FY): /FY 05 /FY 06 /FY 07 \$40 K NF NF

TYPE OF PROGRAM/APPLICATION

• Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: an enhanced GOES fog and low cloud image product for nighttime use that will highlight areas of possible low ceilings using satellite infrared and surface temperature data. Large scale composite images for eventual use in AWIPS.
- How will operations be changed/improved: Increase safety by providing forecasters and weather specialists with a briefing and "situational awareness" tool to help determine instrument flight rule (IFR) conditions near airports and along major flight routes.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Office of Research and Applications (ORA) Research Project Plan.
- **Program/Project verification process:** GIMPAP and NWS project reviews.
- *Method used for end product validation:* Pilot reports, METAR surface observations, NOAA-FSL Real-Time Verification System (proposed), and other satellite data.
- Operational training for the user: Periodic workshops sponsored by the National Weather Service, the Cooperative Program for Operational Meteorology Education and Training, the National Weather Association, and the American Meteorological Society. VISIT distance learning module (now available via the Web).

- Next major program milestone: Prototype products for NESDIS operations Early FY05
- *Program becomes operational:* TBD. Product is experimental. Implementation dependant on official request from NWS via Satellite Products and Services Review Board and AWIPS Build schedules.
- *Plans for further improvements:* Reduce under-detection of IFR conditions at night. Further evaluation of Rapid Update Cycle-2 surface temperature data. Develop equivalent product for daytime use.

National Lightning Detection Network (NLDN)

PROGRAM/PROJECT: [http://www.lightningstorm.com/tux/jsp/discover/nldn/index.jsp]
LEAD AGENCY/COLLABORATING AGENCIES: National Oceanic and Atmospheric Administration
(NOAA)/National Weather Service (NWS), Federal Aviation Administration (FAA), Department of Defense (DoD)
LEAD AGENCY POINT OF CONTACT: Joseph Facundo, NWS, 301-713-0341 ext 131,
joseph.facundo@noaa.gov

PROGRAM POINT OF CONTACT: Michael Carelli, NWS, 301-713-1724 ext 184, michael.carelli@noaa.gov

SERVICE AREA (S)/INITIATIVE (S)

National Aviation Weather Initiatives:2: 5.9

FUNDING

• Programmed/Planned (\$'s/FY): NA

TYPE OF PROGRAM/APPLICATION

Acquisition/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: a new contract for lightning data from the National Lightning Detection Network (NLDN).
- How operations will be changed/improved: ensures lightning information in support of safe and efficient operations within the National Airspace System by alerting forecasters, pilots, controllers, and dispatchers to areas of lightning and convective activity.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: The Joint Action Group for Lightning Detection Systems is drafting the Statement of Work.
- *Program/Project verification process:* The NLDN contract is bound by normal contracting controls.
- Method used for end product validation: NA
- Operational training for the user: User publications, hands-on use, and Web-Based information.

- *Next major program milestone:* Release the RFP in first quarter of CY 04.
- *Program becomes operational:* October 1, 2004
- *Plans for further improvements:* Include total lightning and long-range lightning.

Volcanic Ash Forecast Transport and Dispersion (VAFTAD) Model

PROGRAM/PROJECT: [http://www.arl.noaa.gov/ss/models/vaftad.html]

LEAD AGENCY: National Oceanic and Atmospheric Administration (NOAA), Air Resources Laboratory (ARL)

LEAD AGENCY POINT OF CONTACT:

PROGRAM POINT OF CONTACT: Barbara Stunder, ARL, 301-713-0295 ext 114, barbara.stunder@noaa.gov

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives:

FUNDING

• *Programmed/Planned (\$'s/FY):* /FY 05 /FY 06 /FY07

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.:
- How will operations be changed/improved:

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program:
- Program/Project verification process:
- Method used for end product validation:
- Operational training for the user:

- Next major program milestone: The NCEP VAFTAD Model replaced by the HYSPLIT Model in 2004.
- Program becomes operational: NA
- Plans for further improvements: NA

Volcanic Ash Graphic (VAG)

PROGRAM/PROJECT:

LEAD AGENCY/COLLABORATING AGENCIES: National Oceanic and Atmospheric Administration (NOAA), National Environmental Satellite, Data, and Information Service (NESDIS)

LEAD AGENCY POINT OF CONTACT: Grace Swanson, NESIDS/SAB, 301-763-8444, grace.swanson@noaa.gov, Chris Strager, Anchorage VAAC, 907-271-5132, chris.strager@noaa.gov

PROGRAM POINT OF CONTACT: Grace Swanson, NESIDS/SAB, 301-763-8444, grace.swanson@noaa.gov, Chris Strager, Anchorage VAAC, 907-271-5132, chris.strager@noaa.gov

SERVICE AREA (S)/INITIATIVE (S)

National Aviation Weather Initiatives:
 8: 1

FUNDING

• *Programmed/Planned* (\$'s/FY): /FY 05 /FY 06 /FY07

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: a man-machine product that will combine separate graphic and text
 products into one product depicting ash dispersion in accordance with ICAO required Volcanic Ash Advisory
 Center (VAAC) standards.
- How will operations be changed/improved: will provide the Washington and Anchorage Volcanic Ash Advisory Center with an improved graphical analysis and forecast of volcanic ash dispersion out to 18 hours.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: The ICAO Annex 3 and the Washington VAAC requirements document.
- *Program/Project verification process:* There are bi-monthly reviews within NCEP/NCO of all new products under development by the Computer Development Branch
- Method used for end product validation: Establish an objective verification process using imagery, surface observations, and PIREPS to verify ash forecast area coverage, direction and duration.
- *Operational training for the user:* User training is planned through outreach educational programs to Met Watch Offices within the Washington VAAC region.

- *Next major program milestone:* Experimental VAG in the 4QFY05 timeframe.
- *Program becomes operational:* End of 2QFY06.
- Plans for further improvements: N/A

Volcanic Ash Product (VAP)

PROGRAM/PROJECT: Satellite Meteorology and Climatology Division (SMCD),

[http://www.orbit.nesdis.noaa.gov/smcd/opdb/aviation/volc.html]

<u>LEAD AGENCY</u>: National Oceanic and Atmospheric Administration (NOAA), National Environmental Satellite, Data, and Information Service (NESDIS)

<u>LEAD AGENCY POINT OF CONTACT</u>: Mitch Goldberg, NESDIS, 301-763-8078, mitch.goldberg@noaa.gov <u>PROGRAM POINT OF CONTACT</u>: Gary Ellrod, NESDIS, 301-763-8204 ext 140, gary.ellrod@noaa.gov

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives:

FUNDING

Programmed/Planned (\$'s/FY): /FY 05 /FY 06 /FY07
 \$40 K
 NF

TYPE OF PROGRAM/APPLICATION

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: A GOES image product depicting airborne volcanic ash using multi-band IR techniques. Two-satellite composite images for eventual use in AWIPS.
- *How will operations be changed/improved:* Optimal volcanic ash detection from GOES will provide satellite analysts with a better tool for tracking ash clouds than single band IR data, thus leading to better warnings and short range forecasts to en route aircraft.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Office of Research and Applications (ORA) Research Project Plan.
- Program/Project verification process: GIMPAP & NWS Aviation project reviews.
- *Method used for end product validation:* Comparison with reports from aircraft, volcanic observatories, or non-GOES satellite data (AVHRR, MODIS, TOMS, etc).
- Operational training for the user: Periodic workshops sponsored by NWS, Michigan Tech. University, Volcanic Ash Advisory Centers (VAAC), COMET, NWA, and AMS. Distance learning modules to be developed.

- *Next major program milestone:* Prototype GOES multi-spectral product in AWIPS format for NESDIS operations (early FY05).
- *Program becomes operational:* TBD. Dependent on official request from NWS to NESDIS Satellite Products and Services Review Board and AWIPS Build schedules.
- *Plans for further improvements:* Refinement of new GOES-12+ technique using IR bands at 3.9, 11, and 13.3 micrometers. Minimize the diurnal effects due to solar reflectance at 3.9 micrometers.

Wind Gust Potential Product (WGPP)

PROGRAM/PROJECT: Satellite Meteorology and Climatology Division,

[http://www.orbit.nesdis.noaa.gov/smcd/opdb/aviation/mb.html]

<u>LEAD AGENCY</u>: National Oceanic and Atmospheric Administration (NOAA), National Environmental Satellite, Data, and Information Service (NESDIS)

<u>LEAD AGENCY POINT OF CONTACT</u>: Mitch Goldberg, NESDIS, 301-763-8078, mitch.goldberg@noaa.gov <u>PROGRAM POINT OF CONTACT</u>: Kenneth Pryor, 301-763-8204, ken.pryor@noaa.gov

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives:

FUNDING

• **Programmed/Planned** (\$'s/FY): /FY 05 /FY 06 /FY 07 NF NF NF

TYPE OF PROGRAM/APPLICATION

• R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: Numerical indices that estimate the pre-storm potential for convective microbursts in both wet and dry environments using GOES sounder data.
- *How will operations be changed/improved:* Provide lead time (1-3 hours) for forecasters, flight controllers, and dispatchers for the potential for strong convective wind gusts in the airport environment.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Office of Research and Applications (ORA) Research Project Plan.
- **Program/Project verification process:** GOES Improved Measurement Product Assurance Plan (GIMPAP) reviews.
- Method used for end product validation: Comparison of wind gusts or other index values obtained from GOES
 Sounder data and numerical model "first guess" with Storm Prediction Center storm data and METAR reports.
 Comparisons with radiosonde profiles.
- *Operational training for the user:* Periodic workshops sponsored by National Weather Service (NWS), Cooperative Program for Operational Meteorology, Education and Training (COMET), National Weather Association (NWA), and the American Meteorological Society (AMS). NWA and AMS publications. Distance learning modules via VISIT program (completed FY04).

- Next major program milestone: Wet Microburst Severity Index (WMSI) to become available on Web (FY04).
- When program will become operational: Wind Index and Microburst Day Potential Index became available on AWIPS effective with OB-1 (completed May, 2003). Future improvements dependant on AWIPS Build schedules and NWS requirements.
- *Plans for further improvements:* Derived product image formats for AWIPS. Wet Microburst Severity Index (WMSI) upgrades.

Weather and Research Forecast (WRF) Model

<u>PROGRAM/PROJECT</u>: Model Development & Enhancement Product Development Team [http://www.wrf-model.org/]

LEAD AGENCY/COLLABORATING AGENCIES: National Oceanic and Atmospheric Administration (NOAA), Federal Aviation Administration (FAA), Air Force Weather Agency (AFWA), National Science Foundation (NSF), National Center for Atmospheric Research (NCAR), Oklahoma University Center for the Analysis and Prediction of Storms (CAPS), Forecast Systems Laboratory (FSL), National Center for Environmental Prediction (NCEP), Naval Research Laboratory (NRL), Fleet Numerical Meteorology and Oceanographic Center (FNMOC)

LEAD AGENCY POINTS OF CONTACT: Steve Koch, OAR/FSL, 303-497-5487, Steven.Koch@noaa.gov, Lynn Sherretz, OAR/FSL, 303-497-5580, lynn.sherretz@noaa.gov, Jim Sheets, 202-314-1121, james.sheets@auatac.com

PROGRAM POINT OF CONTACT: Stephen Lord, NCEP, 301-763-8005, ext 7202, stephen.lord@noaa.gov, Steve Koch, NOAA-FSL, 303-497-5487, steven.koch@noaa.gov, Nelson Seaman, NOAA/NWS/OS&T, 301-763-8000, ext. 7222, nelson.seaman@noaa.gov

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives: 1: 8,10,11,13 2: 7,10,11,12 3: 7 5: 8, 10 6: 9, 10, 11 7: 8, 10

FUNDING

Programmed/Planned (\$'s/FY): /FY05 FY06 /FY07

TYPE OF PROGRAM/APPLICATION Product Development

- What's being developed, procured, etc: a next-generation mesoscale forecast model and assimilation system that will advance both the understanding and prediction of mesoscale precipitation systems and promote closer ties between the research and operational forecasting communities. The model is being developed as a collaborative effort among several government agencies together with the participation of a number of university scientists.
- How operations will be changed/improved: Common WRF modeling infrastructure shared by research and operations community will provide better forecasts of weather related aviation impact variables, will improve the safety and efficiency of aviation operations, and will sustain an accelerated flow of new science and technology into model forecasts well into the future.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: WRF Management Plan that defines the responsibilities of an Executive Oversight Board, a Research Applications Board, an Operations Requirements Board, a Development Testbed Center, Operational Testbed Centers, a WRF Program Coordinator and Program Office, Development Teams, and Working Groups.
- **Program/Project verification process:** Progress reports to the funding sponsors; periodic design review workshops; input from the Executive Oversight Board and supporting Boards; internal reviews within the participating organizations.
- Method used for end product validation: Idealized model testing against known solutions; extensive model
 evaluation using selected case studies; side-by-side comparison with other research and operations models; realtime experimental forecasting/verification.
- Operational training for the user: Annual user workshops; web-based tutorials; online user documentation.

- Next major program milestone: Implement WRF model at NCEP in High-Resolution Window domains, October 2004.
- *Program becomes operational:* Operational use at NCEP, FSL, 2004, at AFWA in 2005.
- *Plans for further improvements:* Incorporate advanced model physics and advanced data assimilation schemes, extend to include capabilities from Navy's COAMPS model, extend to additional applications (aviation WRF, hurricane WRF, etc.).

Integrated Radar Data Services (IRaDS)

PROGRAM/PROJECT: [http://www.radarservices.org]

LEAD AGENCY/COLLABORATING AGENCIES: National Oceanic and Atmospheric Administration (NOAA), University of Oklahoma Center for Analysis and Prediction of Storms (CAPS), National Severe Storms Laboratory (NSSL), National Climatic Data Center (NCDC), and the University Corporation for Atmospheric Research (UCAR)

<u>LEAD AGENCY POINT OF CONTACT</u>: Tim Crum, NWS MASC W/OPS4, 405-573-8888 tim.d.crum@noaa.gov

PROGRAM POINT OF CONTACT: Joel D. Martin, Director, Integrated Radar Data Services, 405-325-0453, joel.martin@ou.edu

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: None

FUNDING

Self-sustaining, cost-recovery operation with startup investments by the university.

TYPE OF PROGRAM/APPLICATION

Data service.

SCOPE OF PROGRAM/PROJECT

Integrated Radar Data Services (IRaDS) is a program of The University of Oklahoma developed as a top-tier provider of weather radar data transmission, at cost. IRaDS was formed in April 2004 as an outgrowth of a five-year award-winning Collaborative Radar Acquisition Field Test (CRAFT) under the Center for Analysis and Prediction of Storms at OU. CRAFT proved the concept that advanced university-only networking technologies could be harnessed to rapidly concentrate valuable weather data. Once concentrated, the data can then be shared (via standard Internet) for research, government, and private concerns. A memorandum of agreement, signed between OU and the National Oceanic and Atmospheric Administration (NOAA) in April 2004 codified creation of IRaDS as a top-tier provider and an essential mechanism for NOAA to share data via outsourced provisioning through the university environment.

PROGRAM/PROJECT MANAGEMENT

The mission of the University of Oklahoma is to provide the best possible educational experience for our students through excellence in teaching, research and creative activity, and service to the state and society. The IRaDS program model tracks closely with the OU mission by first creating concentrated high-resolution radar data that adds vitality to weather research. IRaDS serves the state by enabling weather commerce with data as a raw material to create a new generation of products and services. Such private growth also leverages legacy research and pushes future research. IRaDS serves society by helping weather experts generate improved weather awareness information for operations efficiency and resource protection.

- Next major program milestone: Addition of more radars and alternative data sources (ongoing)
- Program becomes operational: Currently operational. Began operations August 2004.
- *Plans for further improvements:* Will evolve to a full weather data center concept for collocation of data and data provisioning cost-sharing by subscribers.

Millimeter Cloud Radar (MMCR)

PROGRAM/PROJECT: [http://www.etl.noaa.gov/technology/]

LEAD AGENCY/COLLABORATING AGENCIES: National Oceanic and Atmospheric Administration (NOAA)/Environmental Technology Laboratory (ETL)

LEAD AGENCY POINT OF CONTACT:

PROGRAM POINT OF CONTACT: Robert Kropfli, Environmental Technology Laboratory, 303-497-6235, rkropfli@etl.noaa.gov

SERVICE AREA (S):INITIATIVE (S)

• *National Aviation Weather Initiatives:* N/A See FAA-programs

FUNDING

• *Programmed/Planned* (\$'s/FY): /FY05 /FY06 /FY07

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: MMCR technology is being integrated into a system for the ground-based detection of in-flight icing conditions. See FAA programs.
- How operations will be changed/improved: provide the ability to avoid areas of Super Large Droplets (SLD) that pose a serious icing threat to en-route aircraft.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Information not currently available.
- *Program/Project verification process*: Information not currently available.
- Method used for end product validation:
- *Operational training for the user:* Information not currently available.

- Next major program milestone: NA
- *Program becomes operational:* MMCR is an operational system. Its capability is being incorporated into the FAA's GRIDS.
- Plans for further improvements: NA

Prototype Aviation Collaborative Effort (PACE)

PROGRAM/PROJECT: [http://www.srh.weather.gov/ftproot/sram/pace.htm]

LEAD AGENCY/COLLABORATING AGENCIES: National Oceanic and Atmospheric Administration (NOAA)/National Weather Service (NWS)/Forecast Systems Laboratory (FSL), and the Federal Aviation Administration (FAA)

<u>LEAD AGENCY POINT OF CONTACT</u>: Paul Witsaman, Regional Aviation Meteorologist, Southern Region, 817-978-1100 ext. 116, paul.witsaman@noaa.gov

PROGRAM POINT OF CONTACT: Thomas Amis, CWSU Fort Worth, 817-858-7523, thomas.amis@noaa.gov; Dennis Rogers, NOAA FSL, 303-497-6933, dennis.m.rogers@noaa.gov.

SERVICE AREA (S)/INITIATIVE (S):

• National Aviation Weather Initiatives:

1: 1 **2:** 1 **5:** 1 **7:** 2

FUNDING

• *Programmed/Planned* (\$'s/FY): /FY05 /FY06 /FY07

• Provided by AWRP and NWS SRH

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: a suite of aviation forecast products tailored to the Air Route Traffic Control Center (ARTCC) en-route environment as part of the Traffic Management Unit (TMU) weather requirement definition. The products include convection, icing, turbulence, and ceiling and visibility. One such product is the Tactical Convective Hazard Product (TCHP) that will provide graphical thunderstorm information to decision-makers in an easily understood format. Cross wind Tactical Decision Aid used to provide operational managers with information needed to for flow management and runway capacity based on crosswinds.
- How operations will be changed/improved: More consistent products will enable better decisions concerning the flow of traffic within the National Airspace System.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: PACE Concept of Operations Plan.
- Program/Project verification process: The Aviation Weather Technology Transfer (AWTT) process will be used.
- Method used for end product validation: The Aviation Weather Technology Transfer (AWTT) process will be used
- *Operational training for the user:* Web based power point presentations and one-on-one training from Forecast Systems Laboratory and CWSU Fort Worth, TX.

- Next major program milestone: Completed operational evaluation during the 2003 convective season at Dallas/Fort Worth. Additional evaluation will be conducted in the spring of 2005 for the convective product, crosswind, thunderstorm impacted sectors and NWCF2.
- Program becomes operational: TBD
- Plans for further improvements: 2005 addition of icing, turbulence decision aids and forecasts with new map
 overlays depicting current aircraft location. The PACE web site will also migrate from a web site to a Java
 application, allowing for greater user flexibility and customization.

Pilot Training Initiative (PTI)

PROGRAM/PROJECT: AOPA/ASF Pilot Weather Training Project

LEAD AGENCY/COLLABORATING AGENCIES: Aircraft Owners and Pilots Association (AOPA)/Air

Safety Foundation (ASF), National Oceanic and Atmospheric Administration (NOAA), Meteorologix,

Minneapolis, MN

LEAD AGENCY POINT OF CONTACT: Kevin L. Johnston, NWS/OS23, (301) 713-1726 ext 116,

Kevin.L.Johnston@noaa.gov

PROGRAM POINT(S) OF CONTACT: Carl Weiss, NWS/OS23, (301) 713-1726 ext 149, carl.weiss@noaa.gov

Kevin Murphy, AOPA/ASF, (301) 695-2131, kevin.murphy@aopa.org

SERVICE AREA(S)/INITIATIVE(S):

• National Aviation Weather Initiatives: "Pilot and Controllers Training - Develop and implement new training products for pilots and controllers on the interpretation of weather products. (NWS/FAA/Aviation Associations)." This language is contained in the 2005 Aviation Initiative.

FUNDING

Programmed/Planned (\$'s/FY): \$30K/FY05 \$15K/FY06 \$50K/FY07

TYPE OF PROGRAM/APPLICATION: Weather training for Certificated Flight Instructors and general aviation

(GA) pilots

SCOPE OF PROGRAM/PROJECT:

• What's being developed, procured, etc:

New training materials (live seminar and DVDs followed by expanded online training) for GA pilots and Certificated Flight Instructors on the interpretation and practical application of aviation weather products.

• How will operations be changed/improved:

Improved interpretation, correlation and aeronautical decision-making skills will result in a reduction in GA accidents due to adverse weather.

PROGRAM/PROJECT MANAGEMENT:

Basic guidance document for this program:

 AOPA/ASF 2005 Tactical Plan

 Program/Project verification process:

 Periodic progress reports

Method used for product validation:
 Number of pilots trained (seminar attendance – live

and DVD distribution count)

• Operational training for the user: Nationwide live seminars in most major U.S. cities

during FY05; standalone program version on DVD for smaller venues; development and national distribution of interactive online training in

subsequent years

SCHEDULE/IMPLEMENTATION:

• Next major program milestone: Seminar delivery to begin

Program becomes operational October 2004

• Plans for further improvements Improvements made as needed

Aviation Operations Course (AOC)

PROGRAM/PROJECT: NWS Aviation Operations Course

LEAD AGENCY/COLLABORATING AGENCIES: National Oceanic and Atmospheric Administration (NOAA)/National Weather Service (NWS)

LEAD AGENCY POINT OF CONTACT: Kevin L. Johnston, NWS/OS23, (301) 713-1726 ext 116, Kevin.L.Johnston@noaa.gov

PROGRAM POINT(S) OF CONTACT: Carl Weiss, NWS/OS23, (301) 713-1726 ext 149, carl.weiss@noaa.gov

Michael Dion, NWS/OS6, (301) 713-0280 ext 111, <u>michael.dion@noaa.gov</u> Jerry Griffin, NWS/OS6, (816) 880-9368 ext 234, jerry.griffin@noaa.gov

SERVICE AREA(S)/INITIATIVE (S):

• National Aviation Weather Initiatives: AOC is contained in the 2005 NWS Aviation Weather Initiative

FUNDING

• *Programmed/Planned (\$'s/FY)*: \$0/FY05 \$0/FY06 \$0/FY07

TYPE OF PROGRAM/APPLICATION: Training for NWS aviation forecasters

SCOPE OF PROGRAM/PROJECT:

• What's being developed, procured, etc:

Training is planned for NWS aviation forecasters to give them a better understanding of:

- a) where within NWS aviation products and services are generated
- b) what these products are
- c) who our aviation customers are
- d) what impacts NWS products and services have on our aviation customers
- How will operations be changed/improved: Better understanding of who NWS aviation customers are and the
 important impacts aviation forecasts have on them, coupled with an understanding of where their forecasts fit into
 the entire suite of NWS aviation products will enable NWS aviation forecasters to produce forecasts of greater
 utility.

PROGRAM/PROJECT MANAGEMENT:

- Basic guidance document for this program: FY 2005 Implementation Plan for NWS Training and Education
- *Program/Project verification process:* Number of forecasters taking the course
- Method used for product validation: Course completion; final exam score of ≥70%
- *Operational training for the user:* The AOC will be online at the NWSTC web site and available to NWS forecasters. The AOC will be added as a requirement for the NWS Forecaster Development Program.

- Next major program milestone: Training becoming operational
- **Program becomes operational:** November 2004
- *Plans for further improvements:* Improvements will be made based on suggestions by forecasters who have completed the course and as the course content changes.

Hybrid Single Particle Lagrangian Integrated Trajectory (HYSPLIT) Model

PROGRAM/PROJECT: [http://www.arl.noaa.gov/ready/hysplit4.html]

LEAD AGENCY/COLLABORATING AGENCIES: National Oceanic and Atmospheric Administration (NOAA), Air Resources Laboratory (ARL)

LEAD AGENCY POINT OF CONTACT:

PROGRAM POINT OF CONTACT: Barbara Stunder, NOAA/ARL, 301-713-0295 ext 114,

Barbara.Stunder@noaa.gov

SERVICE AREA(S)/INITIATIVE (S)

National Aviation Weather Initiatives:
8: 5.6

FUNDING

• Programmed/Planned (\$'s/FY):

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: HYSPLIT will be replacing VAFTAD as the NCEP dispersion model for volcanic ash. HYSPLIT can run on output from meteorological models of varying scales corresponding to the spatial/temporal scale of interest. HYSPLIT can also simulate dispersion of other airborne hazardous materials.
- How will operations be changed/improved: Improved dispersion forecasts of volcanic ash and other airborne hazardous materials will allow better strategic and tactical avoidance of hazardous materials with the potential of saving aircraft and lives.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: N/A
- Program/Project verification process: N/A
- *Method used for product validation:* The model output is evaluated using satellite imagery or other measurements or observations.
- Operational training for the user: Hands-on training and text materials.

- Next major program milestone: N/A
- **Program becomes operational:** HYSPLIT is currently the NCEP operational dispersion model for radiological applications. An upgraded HYSPLIT that will be used for all NCEP dispersion applications is expected to replace VAFTAD and the current HYSPLIT in 2005.
- Plans for further improvements: N/A

Terminal Area Forecast (TAF) Improvement

PROGRAM/PROJECT: NWS Aviation Initiative

LEAD AGENCY/COLLABORATING AGENCIES National Oceanic and Atmospheric Administration (NOAA)/National Weather Service (NWS)

<u>LEAD AGENCY POINT OF CONTACT:</u> Kevin L. Johnston, NWS/OS23, 301-713-1726 ext 116, Kevin.L.Johnston@noaa.gov

PROGRAM POINT OF CONTACT: Michael Graf, NWS, 301-713-1726 ext 117, Michael.graf@noaa.gov

SERVICE AREA(S)/INITIATIVE (S)

• National Aviation Weather Initiatives:

FUNDING

• *Programmed/Planned* (\$'s/FY): \$400K/FY05 \$400K/FY06 \$300K/FY07

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: an upgrade to the Aviation Forecast Preparation System (AvnFPS) to improve Terminal Area Forecasts with the application of new forecasting tools and verification techniques.
- How will operations be changed/improved: improve short-term (1-4 hrs) accuracy by use of conditional climatology. Reduce the time required to develop TAFs and upgrade the monitoring function to aid in more timely amendments for changing weather conditions.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: AvnFPS 2.1 User's Guide, June 17, 2004.
- Program/Project verification process: Field testing.
- *Method used for product validation:* Field evaluation.
- Operational training for the user: On line.

- Next major program milestone: AvnFPS 3.1.
- *Program becomes operational:* September 2005.
- Plans for further improvements: Continue to refine smart tools and introduce first-guess TAF.

Collaborative Convective Forecast Product (CCFP)

PROGRAM/PROJECT: [http://cdm.aviationweather.gov/ccfp/]

LEAD AGENCY/COLLABORATING AGENCIES: National Oceanic and Atmospheric Administration

(NOAA)/National Weather Service (NWS), Federal Aviation Administration (FAA)

LEAD AGENCY POINT OF CONTACT: Mark Andrews, NWS, 301-713-1726 ext 109,

mark.andrews@noaa.gov

PROGRAM POINT OF CONTACT: Fred Johnson, NWS/AWC, 816-584-7204, fred.johnson@noaa.gov

SERVICE AREA(S)/INITIATIVE (S)

National Aviation Weather Initiatives:

2: 1

FUNDING

• Programmed/Planned (\$'s/FY): NA

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: 2 to 6 hour collaborative convective forecasts, in 2-hour incremented forecast periods, issued every two hours 22 hours per day from March through October.
- How will operations be changed/improved: : improves timeliness, accuracy, and relevance of convective weather forecasts for pilots and air traffic management and enhances daily traffic management plans in response to predicted weather impacts to operations. Strategy for traffic flow within the National Airspace System is based on this single forecast.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: NWS Instruction 10-810.
- Program/Project verification process: Real-Time Verification System (RTVS).
- Method used for product validation:
- *Operational training for the user:* On line at http://cdm.aviationweather.gov/ccfp/docs/ccfp_brief_files/frame.html

- Next major program milestone: N/A
- **Program becomes operational:** The CCFP became operational May 2000.
- Plans for further improvements: N/A

Graphical Forecast for Aviation (GFA)

PROGRAM/PROJECT: NWS Aviation Initiative

LEAD AGENCY/COLLABORATING AGENCIES: National Oceanic and Atmospheric Administration (NOAA)/National Weather Service (NWS)

<u>LEAD AGENCY POINT OF CONTACT</u>: Kevin L. Johnston, NWS/OS23, (301) 713-1726 ext 116, Kevin.L.Johnston@noaa.gov

PROGRAM POINT OF CONTACT: Michael Graf, NWS/OS23, 301-713-1726 ext 117 michael.graf@noaa.gov

SERVICE AREA(S)/INITIATIVE (S)

• National Aviation Weather Initiatives:

FUNDING

• Programmed/Planned (\$'s/FY): \$300K/FY05 \$300K/FY06 \$300K/FY07

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: new aviation forecast products which are graphically based using georeferenced digital objects. The new standard will require improvements to NWS production software and improvement to user software so that the new products can be visualized.
- *How will operations be changed/improved:* GFA will enhance the ability of users to understand and apply forecast information by allowing graphical forecast information to be displayed on many types of display units.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Under development.
- Program/Project verification process: TBD
- Method used for product validation: TBD
- Operational training for the user: TBD

- Next major program milestone: TBD
- *Program becomes operational:* Planned for January 2006.
- Plans for further improvements: TBD

Distance Learning Aviation Courses (DLAC)

PROGRAM/PROJECT: NWS/COMET Distance Learning Aviation Courses (DLAC)

LEAD AGENCY/COLLABORATING AGENCIES: National Oceanic and Atmospheric Administration (NOAA)/National Weather Service (NWS) in collaboration with the University Corporation for Atmospheric Research (UCAR)/Cooperative Program for Operational Meteorology, Education and Training (COMET)

LEAD AGENCY POINT(S) OF CONTACT: Kevin L. Johnston, NWS/OS23, (301) 713-1726 ext 116, Kevin.L.Johnston@noaa.gov Eli Jacks, NWS/OS6, (301) 713-0280 ext 124, elliott.jacks@noaa.gov

PROGRAM POINT(S) OF CONTACT: Carl Weiss, NWS/OS23, (301) 713-1726 ext 149, carl.weiss@noaa.gov Mike Dion, NWS/OS6, (301) 713-0280 ext 111, michael.dion@noaa.gov Dr. Joe Lamos, COMET, (303) 497-8465, lamos@comet.ucar.edu

SERVICE AREA(S)/INITIATIVE(S):

National Aviation Weather Initiatives: DLAC is contained in the 2005 NWS Aviation Weather Initiative

Programmed/Planned (\$'s/FY): \$250K/FY05 \$250K/FY06 \$250K/FY07

TYPE OF PROGRAM/APPLICATION: Training for NWS aviation forecasters

SCOPE OF PROGRAM/PROJECT:

What's being developed, procured, etc:

Interactive training courses for forecasters on various aviation weather hazards are being and will be developed by COMET. The initial course on low-cloud and fog forecasting for aviation (DLAC1) is operational and online. The 2nd course on convective forecasting for aviation (DLAC2) is in its early stages of development

How will operations be changed/improved:

As a result of this training, NWS forecasters will be better able to forecast weather phenomena influencing aviation and will have an deeper understanding of what impacts their forecasts have on aviation operations. Improved aviation weather forecasts will lead to safer, more efficient and more economical aircraft operations.

PROGRAM/PROJECT MANAGEMENT:

- Basic guidance document for this program: DLAC Project Plan FY 2005 Implementation Plan for NWS Training and Education FY 2005 COMET Program Plan
- *Program/Project verification process:* Monthly reports as part of the COMET update.
- Method used for product validation: Initially quiz scores; in time forecast verification scores.
- Operational training for the user: Since DLAC1 was first offered to NWS forecasters in June

2003, 611 have registered for the course and 366 have graduated.

- Beta testing of DLAC2, 1st quarter FY06 Next major program milestone: Initial DLAC2 delivery, 2nd quarter FY06 Program becomes operational:
- Plans for further improvements:
- DLAC1 is frequently improved based on student input. Improvements to subsequent DLACs will follow this rationale.

Appendix A-4 Department of Defense (DOD)

DOD-1	CDFS II	Cloud Depiction and Forecast System
DOD-2	AMS	Automatic Meteorological Station
DOD-3	TMOS	Tactical Meteorological Observing System
DOD-4	TWR	Tactical Weather Radar
DOD-5	OPUP	Open Principal User Processor (NEXRAD)
DOD-6	N-TFS	New-Tactical Forecast System
DOD-7	JET	Joint Environmental Toolkit
DOD-8	AOS	Automated Observing System
DOD-9	OPS II	Operational Weather Squadron Production System II
DOD-10	WWx	War Weather (Electro-optical Weapons Decision Aid)
DOD-11	GTWAPS	Global Theater Weather Analysis and Prediction System
DOD-12	REIP	Reengineered Enterprise Infrastructure Program
DOD-13	SWAFS	Space Weather Analysis and Forecast System
DOD-14	PUFF	Volcanic Ash Dispersion Model
DOD-15	JWIS	Joint Weather Impacts System
DOD-16	ISOON	Improved Solar Observing Optical Network
DOD-17	DISS	Digital Ionospheric Sounding System
DOD-18	RSTN	Radio Solar Telescope Network
DOD-19	IMS	Ionospheric Measuring System
DOD-20	WDAC	Weather Data Analysis Capabilities
DOD-21	MWFM	Mountain Wave Forecast Model
DOD-22	NAAPS	Navy Aerosol Analysis and Prediction System
DOD-23	ASOS	Automated Surface Observing System
DOD-24	SWR	Supplemental Weather Radar
DOD-25	NITES	Naval Integrated Tactical Environmental Subsystem
DOD-26	TEDS	Tactical Environmental Data Services
DOD-27	METOC	Meteorology and Oceanography Portal
DOD-28	RAWS	Remote Automated Weather Sensor
DOD-29	NFWB	Navy Flight Weather Briefer Web
DOD-30	NSDS-E	Naval Satellite Display System-Enhanced
DOD-31	METMF	Meteorological Mobile Facility Next Generation
DOD-32	OPUP	Open Principal User Processor
DOD-33	NWP	Numerical Weather Prediction
DOD-34	ESID	Electrical Storm Identification Device
DOD-35	LPATS	Lightning Position and Tracking System
DOD-36	MIDDS	Meteorological Integrated Data Display System
DOD-37	IRP	Icing Research Program
DOD-38	MMS-P	Meteorological Measuring Set – Profiler
DOD-39	IMETS	Integrated (Mobile) Meteorological System
- 	~	

Cloud Depiction and Forecast System (CDFS II)

PROGRAM/PROJECT:

LEAD AGENCY: Headquarters United States Air Force, Directorate of Weather (HQ USAF/XOO-W) **LEAD AGENCY POC:** HQ USAF/XOO-WR, 703-696-4930, DSN 426-4930, afxoowr@pentagon.af.mil **PROGRAM POC:** Mr. Chris Finnigsmier, 402-294-5700, Christopher.Finnigsmier@afwa.af.mil

SERVICE AREA(S)/INITIATIVE(S)

National Aviation Weather Initiatives:
1: 5

FUNDING

• Programmed/Planned (\$'s/FY):

TYPE OF PROGRAM/APPLICATION

Product Development/Product Improvement

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: real-time cloud analyses and forecasts supporting Air Force, Army, National Intelligence Community, and other processing centers including the National Weather Service and Navy. CDFS II performs real-time data fusion from multiple sources.
- How operations have been changed/improved: improved support (finer scale resolution) to decision makers that require cloud cover information.

PROGRAM/PROJECT MANAGEMENT

- *Basic guidance document for this program:* Operational Requirements Document for Cloud Depiction and Forecast System (CDFS) II, USAF ORD 005-92-I/II/III (3 Sep 1993, approved by CSAF 3 Dec 1993) HQ USAF Mission Needs Statement (MNS) 005-92, Cloud Depiction & Forecast System II (10 Sep 1992)
- *Program's verification process:* CDFS II followed a 4-build spiral development evolutionary acquisition strategy where in each build identified requirements are tested.
- Method used for end product validation: AFWA staff experts made comparisons between raw satellite imagery, the old RTNEPH analysis algorithm output, and the CDFS II SERCAA output. Continual evaluation and product quality improvement mechanisms and system capabilities exist.
- Operational training for the user: Operator training was provided prior to system delivery. Follow-on training will be provided by the contractor on an as-needed basis at additional cost. The formal courses were specifically designed for operators, programmers, and data base administration courses.

- *Next major program milestone:* CDFS II transitions from Air Force Space Command to the Air Force Weather Agency for operations and maintenance in FY04.
- *Program becomes operational:* CDFS II was operational on June 24, 2002.
- Plans for Further improvements: Technology refreshments are planned for FY04 and Hardware refresh for FY05.

AN/FMQ-19 Automatic Meteorological Station (AMS)

PROGRAM/PROJECT:

LEAD AGENCY: Headquarters United States Air Force, Directorate of Weather (HQ USAF/XOO-W) **LEAD AGENCY POC:** HQ USAF/XOO-WR, 703-696-4930, DSN 426-4930, afxoowr@pentagon.af.mil **PROGRAM POC:** Maj. David Beberwyk, Air Force Weather Agency, AFWA/XPFC, 402-294-9559, DSN 271-9559, david.beberwyk@afwa.af.mil; Mr. John Kennedy, ESC/ACW, 781-271-9144, DSN 845-9144 John.Kennedy@hanscom.af.mil

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives:

1: 5,7 **2:** 5 **4:** 2 **6:** 6

FUNDING

• Programmed/Planned (\$'s/FY):

TYPE OF PROGRAM/APPLICATION

Decision Support

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: an automated observing system that samples, measures/calculates, and reports free air and dew point temperatures, wind speed and direction, lightning, thunderstorms, visibility, runway visual range, cloud base height and amount of coverage, pressure, liquid equivalent precipitation accumulation, type of precipitation, and ice accretion during freezing precipitation. The heart of the system is the Federal Standard Meteorological Algorithms used in the Automated Surface Observing System (ASOS) ensuring weather observations from AF bases and Army posts will be as representative as those at FAA and NWS ASOS locations.
- How operations will be changed/improved: automated observations at approximately 217 worldwide Air Force locations will contribute to improved aviation forecasts.

PROGRAM/PROJECT MANAGEMENT

- *Basic guidance document for this program:* Requirements for this program are documented in the Air Force Observing System 21st Century (OS-21) Operational Requirements Document (ORD)
- *Program's verification process:* Spiral development acquisition strategy where each spiral consists of a 12-month period at which time the government and contractor test against identified requirements. This program is currently undergoing source selection. Configuration and functional audits will be completed at Final Operational Capability (FOC)
- *Method used for end product validation:* System testing will be performed. The government shall perform a Functional Configuration Audit (FCA) on the system at McChord AFB to substantiate that the system, as installed, satisfies the functional requirements of the Technical Requirements Document (TRD). The government shall perform a Physical Configuration Audit (PCA) on the weather components installed at McChord AFB and Spangdahlem AB to establish a physical configuration baseline at each site.
- Operational training for the user: Both hands-on and text training materials are provided by the contractor to users to allow the government to make effective use of the system.

- Next major program milestone: FMQ-19/NTFS Interface by Nov05
- Program becomes operational: IOC expected by early in FY06 waiting on interface with NTFS.
- *Plans for further improvements*: Follow-on improvements through technology refreshments and incremental technology insertions are planned through FY09.

AN/TMQ-53 Tactical Meteorological Observing System (TMOS)

PROGRAM/PROJECT:

LEAD AGENCY: Headquarters United States Air Force, Directorate of Weather (HQ USAF/XOO-W) **LEAD AGENCY POC:** HQ USAF/XOO-WR, 703-696-4930, DSN 426-4930, afxoowr@pentagon.af.mil **PROGRAM POC:** Maj. David Beberwyk, Air Force Weather Agency, AFWA/XPFF, 402-294-9559, DSN 271-9559, david.beberwyk@afwa.af.mil; Mr John Kennedy, ESC/ACW, 781-271-9144, john kennedy@hanscom.af.mil

SERVICE AREA(S)/INITIATIVE(S)

National Aviation Weather Initiatives:
1: 5, 7
2: 5
6: 6

FUNDING

• Programmed/Planned (\$'s/FY):

TYPE OF PROGRAM/APPLICATION

Decision Support

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: a suite of automated, tactical weather sensors to replace legacy systems. TMOS provides for the automated collection of weather elements in a deployed environment and formats aviation meteorological observations (METAR and SPECI) for manual or automatic transmission into the worldwide weather telecommunications network. Eighty-nine complete systems will be purchased to satisfy 100% of worldwide Air Force Weather requirements.
- How operations will be changed/improved: automated, scaleable observations will improve support to tactical Air Force and Army operations.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Requirements for this program are documented in the Air Force TACMET Mod Technical Requirements Document (TRD) and Operational System-21 (OS-21) Operational Requirements Document.
- Program's verification process: Spiral development acquisition strategy, each spiral consists of a 12-month
 period when the government and contractor test against identified requirements. INCO has been completed and
 systems are currently being delivered.
- *Method used for end product validation:* OT&E completed Jun 99. Physical and functional configuration audits were accomplished in FY99 during the qualification testing.
- Operational training for the user: Both hands-on and text training materials are provided by the contractor to users to allow the government to make effective use of the system. Mobile training teams conducted training when the first systems where delivered in Sep 00.

- Next major program milestone: Deployment of an Iridium SatCom solution to push observations back from austere locations
- When program will become operational: TMOS is an operational system.
- Plans for further improvements: Follow-on advanced development is anticipated as sensor improvements are
 realized and computer resources continue to improve. Follow-on improvements through technology
 refreshments and incremental technology insertions are planned through FY07.

Tactical Weather Radar (TWR)

PROGRAM/PROJECT:

<u>LEAD AGENCY</u>: Headquarters United States Air Force, Directorate of Weather (HQ USAF/XOO-W) <u>LEAD AGENCY POC</u>: HQ USAF/XOO-WR, 703-696-4930, DSN 426-4930, afxoowr@pentagon.af.mil <u>PROGRAM POC</u>: Mr. Buzz Kandler, Air Force Weather Agency, AFWA/XPFC, 618-256-9734, DSN 576-9734, raymond.kandler@afwa.af.mil; Mr. Tony Talbot, OO-ALC/LHW, DSN 586-2194, Anthony.Talbot@hill.af.mil

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: 2: 5. 9

FUNDING

• Programmed/Planned (\$'s/FY):

TYPE OF PROGRAM/APPLICATION

Decision Support

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: fixed and semi-fixed Tactical (doppler) Weather Radars (TWR). A total of 7 fixed, 2 semi-fixed and 1 depot radar are being procured to provide resource protection at overseas locations
- How operations will be changed/improved: provide weather information for resource protection at fixed and deployed environments (overseas).

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Combat Air Force (CAF) USAF Mission Needs Statement (CAF MNS) 301-93, Tactical Weather Radar (TWR), 1 Nov 93. Operational Requirements Document (ORD), USAF (CAF) 301-92-I/III, 4 June 97,
- Program's verification process:
- *Method used for product validation:* Product validation based on certified manufacturers test data. Factory and field system acceptance testing accomplished for each production system delivered.
- *Operational training for the user:* Both hands-on and text initial training materials were provided by the contractor during installation to allow the government to make effective use of the system. Computer based follow-on training is also available.

- Next major program milestone: N/A
- When program will become operational: TWR is an operational system.
- *Plans for further improvements:* Follow-on system modifications are anticipated as improvements to the radar system are developed by the prime equipment manufacturer. Follow-on improvements through incremental technology insertions are planned through FY07.

Open Principal User Processor (OPUP)

PROGRAM/PROJECT:

LEAD AGENCY: Headquarters United States Air Force, Directorate of Weather (HQ USAF/XOO-W) **LEAD AGENCY POC:** HQ USAF/XOO-WR, 703-696-4930, DSN 426-4930, afxoowr@pentagon.af.mil **PROGRAM POC:** Maj. David Beberwyk, Air Force Weather Agency, AFWA/XPFC, 402-294-9559, DSN 271-9559, david.beberwyk@afwa.af.mil; Mr. Mike Spaulding, AFWA/XPFC, 618-256-9733, DSN 576-9733

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: N/A

FUNDING

• Programmed/Planned (\$'s/FY):

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: replacement of WSR-88D Principal User Processors at Air Force units. It is being implemented in three spiral phases in support of Air Force Weather's reengineering. Spiral 1 installs four large OPUPs in the Air Force's four Operational Weather Squadrons (regional weather hubs) in the continental United States and two additional units for system development and a support hot line capability established at the NEXRAD Operational Support Facility (OSF). Spiral II will install three medium sized OPUPs and three small OPUPs (OSF, Patrick AFB and Vandenberg AFB) and a system at the weather training school at Keesler AFB. Spiral III will install 90 small OPUPs at 90 Combat Weather Team (unit level) locations worldwide.
- How operations will be changed/improved: an improved graphical user interface and a capability to provide multiple dedicated connections from a common workstation and rapid access to convective hazard information.

PROGRAM/PROJECT MANAGEMENT

- *Basic guidance document for this program:* Requirements for this program are documented in the Air Force AF Form 1067, approved by Weather Weapon System Product Improvement Working Group (PIWG) 16 Jul 96.
- Program's verification process: Developmental Test and Evaluation during Spiral I & II, critical design review, and full system testing.
- Method used for product validation: ROC will evaluate system performance against specified requirements.
- Operational training for the user: Both hands-on and text training materials are provided by the contractor to users to allow the government to make effective use of the system.

- Next major program milestone: Spiral II and III are scheduled for completion in Mar 06.
- When program will become operational: OPUP is an operational system.
- Plans for further product improvements: N/A

New-Tactical Forecast System (N-TFS)

PROGRAM/PROJECT:

LEAD AGENCY: Headquarters United States Air Force, Directorate of Weather (HQ USAF/XOO-W) **LEAD AGENCY POC:** HQ USAF/XOO-WR, 703-696-4930, DSN 426-4930, afxoowr@pentagon.af.mil **PROGRAM POC:** Maj. Steve Renner, AFWA/XPFT, 402-294-4233, DSN 271-4233, steven.renner@afwa.af.mil;;

Mr Tod Kunschke, HQ AFWA/XPFT, 402-294-5124, DSN 271-5124, tod.kunschke@afwa.af.mil

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: 1: 9 2: 8 5: 7 6: 5 7: 6

FUNDING

• Programmed/Planned (\$'s/FY):

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: a tactical weather workstation for receiving, tailoring, and producing weather products. The New-Tactical Forecast System (N-TFS) is being procured in 4 increments. N-TFS 1.0 was fielded at 168 Air Force weather units worldwide for use in preparing weather products supporting Army and Air Force ground and air operations. N-TFS 2.0 was a client/server replacement with a significant software upgrade to improve the graphical user interface. N-TFS 3.1 replaced in-garrison servers, implement deployable servers and client hardware, and includes a minor software upgrade. N-TFS 3.2 will be a major software upgrade with open architecture compliant modules improving commonality and interoperability with similar weather information production systems.
- How operations will be changed/improved: provides a capability to obtain, analyze, tailor and disseminate mission specific weather information (focused on service unique mission areas) using web-enabled technologies. Provides a capability to receive products from both strategic and operational levels and transmit information to supported locations and other N-TFS sites.

PROGRAM/PROJECT MANAGEMENT

- *Basic guidance document for this program:* Operational Requirements Document USAF 001-94-I/II/III-B, Forecast System 21st Century, 25 Mar 99; USAF Mission Need Statement (MNS) 001-94.
- *Program's verification process:* Acquisition is via a spiral development strategy. Each spiral consists of a 12-month period when the government and contractor test against identified requirements. N-TFS 3.1 Force Development Evaluation (FDE) occurred in Sep 2002.
- Method used for end product validation: Products received from other production systems are assumed to be
 valid. Units conduct periodic review of mission execution forecasts and collect metrics on relevancy and
 accuracy to mission accomplishment.
- *Operational training for the user:* Trained government personnel will perform hands-on training of the users while the contractor will supply text formatted training materials.

- Next major program milestone: Fielding of N-TFS 3.2, Nov 05.
- Program becomes operational: N-TFS is an operational system and will be subsumed by JET in FY06.
- Plans for further product improvements: Periodic hardware and software refresh will occur throughout the life
 of N-TFS.

Joint Environmental Toolkit (JET)

PROGRAM/PROJECT:

LEAD AGENCY: Headquarters United States Air Force, Directorate of Weather (HQ USAF/XOO-W) **LEAD AGENCY POC:** HQ USAF/XOO-WR, 703-696-4930, DSN 426-4930, afxoowr@pentagon.af.mil **PROGRAM POC:** Maj. Steve Renner, AFWA/XPFT, 402-294-4233, DSN 271-4233, steven.renner@afwa.af.mil;;

Mr Tod Kunschke, HQ AFWA/XPFT, 402-294-5124, DSN 271-5124, tod.kunschke@afwa.af.mil

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: 1: 9 2: 8 5: 7 6: 5 7: 6

FUNDING

• Programmed/Planned (\$'s/FY):

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: a combination of four of the AFWWS current systems: NTFS(CWT), IMETS (Army CWT weather system), OPS-II (OWS), and JWIS (C2 Integration). JET combines these systems to create efficiencies in the Human-Machine Interface for like forecasting requirements and provides a robust presence in C4ISR systems.
- How operations will be changed/improved: JET provides automated, web and data-centric capabilities as well as a common HMI across all levels of AFW operations and support Joint and Coalition Operations World-Wide.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: USAF Operational Requirements Document (ORD) 001-94-I/II/III-A, Tactical Observing and Forecasting System, 14 Nov 96; USAF ORD 001-94-I/II/III-B, Forecast System 21st Century, 25 Mar 99; USA ORD for Integrated Meteorological System (IMETS), 12 Jul 03; USAF Mission Need Statement (MNS) 001-94, Meteorological Operational Capability, 20 Mar 95; USAF MNS 003-94, Centralized Aerospace Weather Capability, 12 Jun 95; Global Command and Control System (GCCS) METOC CONOPS 18 Aug 97; USAF ORD 006-00, Air Operations Center Modernization Program, 21 May 01.
- *Program's verification process:* Acquisition is via a increment development strategy after an initial fly-off competition between two contractors, Raytheon and Northrup-Grumman, due for down-select in 1FY06. Each increment consists of a 12-18-month period when the government and contractor test against identified requirements.
- *Method used for end product validation:* Products received from other production systems are assumed to be valid. Units conduct periodic review of mission execution forecasts and collect metrics on relevancy and accuracy to mission accomplishment.
- *Operational training for the user:* Initial Training will be contractor provided. Trained government personnel will perform hands-on training of the users while the contractor will supply text formatted training materials.

- Next major program milestone: Down-select to winning contractor 1FY06.
- *Program becomes operational:* IOC 3FY06, FOC FY11.
- *Plans for further product improvements:* Periodic hardware and software refresh will occur throughout the life of JET to advance toward AFWWS FY11 End-State Architecture.

Automated Observing System (AOS)

PROGRAM/PROJECT:

LEAD AGENCY: Headquarters United States Air Force, Directorate of Weather (HQ USAF/XOO-W) **LEAD AGENCY POC:** HQ USAF/XOO-WR, 703-696-4930, DSN 426-4930, scats.xowr@pentagon.af.mil **PROGRAM POC:** Maj. Steve Renner, AFWA/XPFT, 402-294-4233, DSN 271-4233, steve.renner@afwa.af.mil, Mr Todd Kunschke, AFWA/XPFT, 402-294-5124, DSN 271-5124, tod.kunschke@afwa.af.mil, Mr Barry Mareiro, ESC/ACW, (781) 271-5458, DSN 478-1186, (pause) ext.15458, barry.mareiro@hanscom.af.mil

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives:

FUNDING

• Programmed/Planned (\$'s/FY): /FY03 /FY04

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: a capability to remotely conduct a meteorological watch by monitoring weather sensors via the internet. AOS is commercial software that runs on a low-end Pentium based PC that collects data from various weather sensors. The data is then sent via the internet to client software resident at various Air Force weather facilitates.
- How operations will be changed/improved: allows meteorological watch of many locations remotely from one work position using minute-by-minute data vice waiting for hourly or special weather observations.

PROGRAM/PROJECT MANAGEMENT

- *Basic guidance document for this program:* The guidance for this system is outlined in the Air Force's Strategic Plan for Air Force Weather Reengineering.
- **Program's verification process:** Purchased as a commercial item.
- *Method used for end product validation:* Comparison of the output from stand-alone weather sensors against the AOS observation.
- *Operational training for the user:* Operators are trained during installation. On line help is also provided with commercial software.

- Next major program milestone: N/A
- **Program becomes operational:** AOS is an operational system.
- Plans for further product improvements: None.

Operational Weather Squadron Production System II (OPS II)

PROGRAM/PROJECT:

LEAD AGENCY: Headquarters United States Air Force, Directorate of Weather (HQ USAF/XOO-W) **LEAD AGENCY POC:** HQ USAF/XOO-WR, 703-696-4930, DSN 426-4930, afxoowr@pentagon.af.mil **PROGRAM POCS:** Maj. Steve Renner, HQ AFWA/XPFT, 402-294-4233, DSN 271-4233, steven.renner@afwa.af.mil

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: N/A

FUNDING

• Programmed/Planned (\$'s/FY):

TYPE OF PROGRAM/APPLICATION

Product Dissemination

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: a weather information production system to support the Air Force's new regional Operational Weather Squadrons (OWS). OPS II consists of a suite of servers, workstations, networking equipment, and application software.
- How operations will be changed/improved: enables OWS forecasters to produce and disseminate products to weather units supporting operations. It uses strategic level and indigenous weather information and data to produce standardized and on-demand forecast products. OPS II enables the OWS to prepare terminal aerodrome forecasts and point weather warnings for AF bases and Army posts in its area of responsibility.

PROGRAM/PROJECT MANAGEMENT

- *Basic guidance document for this program*: Strategic Plan for Air Force Reengineering and OPS II Program Development Plan (PDP). Operational Requirements Document USAF 001-94-I/II/III-B, Forecast System 21st Century, 25 Mar 99.
- *Program's verification process:* Spiral development acquisition strategy. Each spiral consists of a 12-18 month period where the government and contractor test against identified requirements. Configuration and functional audits have been completed. A Qualification Operational Test & Evaluation (QOT&E) was conducted in Dec 99 on the Spiral 1B1 hardware and software. In Dec 01, a Force Development Evaluation (FDE) was conducted on the Increment 3.2.2 hardware and software. An FDE will be conducted before each incremental delivery.
- Method used for end product validation: All products created by the forecasters in the different OWS functions
 (flight weather briefer, TAF/WW/METWATCH, regional graphics, etc) must go through the chief forecaster
 before being released to the OWS web page. The OWS also keeps monthly metrics on the accuracy of their
 forecasts.
- Operational training for the user: Both hands-on and text training materials are provided by the contractor to users to allow the government to make effective use of the system. Additional training is provided on request.

- Next major program milestone: N/A
- Program becomes operational: OPS II reached Final Operational Capability (FOC) 4QFY02.
- Plans for further product improvements: Follow-on advanced development is anticipated as improvements to numerical modeling are developed and computer resources continue to improve. Follow-on improvements through technology refreshments and incremental technology insertions are planned throughout the incremental deliveries.

War Weather (WWx)

PROGRAM/PROJECT:

<u>LEAD AGENCY</u>: Headquarters, Air Force Weather Agency (HQ AFWA)

LEAD AGENCY POC: Maj. Steve Renner, HQ AFWA/XPFT, (402) 294-4233, DSN 271-4233,

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Leandro.Delgado@afwa.af.mil

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: N/A

FUNDING

• Programmed/Planned (\$'s/FY):

TYPE OF PROGRAM/APPLICATION

Decision Support

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: an electro-optical weapons decision aid capability consisting of decision aid product software: Target Area Weather Software (TAWS), Night Vision Goggle Operational Weather Software (NOWS), Infrared Target Scene Simulation Software (IRTSS), and others.
- *How operations will be changed/improved:* Operational forces will use the decision aid outputs for command and control, mission planning, mission execution, training, and simulation support. This capability automates decision aid performance to minimize operational workload and maximize decision aid performance.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: ROC 508-78 Pre-strike Reconnaissance and Surveillance System.
- **Program's verification process:** Spiral development acquisition strategy. Each spiral consists of a 12-month period at which time the government and contractor test against identified requirements. This program is undergoing operational test and evaluation. Configuration and functional audits will be completed at Final Operational Capability (FOC). Spiral deliverables consist of software releases to operators.
- Method used for product validation: Operational validation by AFCCC and other users.
- Operational training for the user: Training included in software help file. VCR tape provided with each delivered version. Distance Learning Course available from Air Force Schoolhouse. The products are taught at the AF Fighter Weapons School at Nellis AFB. NOWS training is being included in the Night Vision Goggles Instructor School at Williams AFB. Annual Instrument Refresher Course (IRC) training in development.

- Next major program milestone: N/A
- *Program becomes operational:* This capability is currently operational.
- *Plans for further product improvements:* Follow-on advanced development is required to include additional weapons systems, command and control systems and operators as they request support. Follow-on improvements are planned through FY07.

Global Theater Weather Analysis and Prediction System (GTWAPS)

PROGRAM/PROJECT:

LEAD AGENCY: Headquarters United States Air Force, Directorate of Weather (HQ USAF/XOO-W) **LEAD AGENCY POC:** HQ USAF/XOO-WR, 703-696-4930, DSN 426-4930, afxoowr@pentagon.af.mil **PROGRAM POC:** Mr. Chris Finnigsmier, Air Force Weather Agency, AFWA/XPSI, 402-294-5700, DSN 271-5700, Christopher.finnigsnier@afwa.af.mil

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: N/A

FUNDING

• *Programmed/Planned (\$'s/FY):*

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What is being developed, procured, etc.: fine-scale visualization products depicting weather impact variables in support of operations. The GTWAPS provides an open, expandable system for advanced target-scale numerical weather modeling capability consisting of a suite of IBM hardware running the Mesoscale Model 5 (MM5) model.
- How operations will be changed/improved: GTWAPS produces a wide variety of visualization products in support of Air Force and Army aviation and ground operations -- improved decision making from resource protection to combat and training operations. GTWAPS replaces the Advanced Weather Analysis and Prediction System (AWAPS).

PROGRAM/PROJECT MANAGEMENT

- *Basic guidance document for this program:* Requirements for this program are documented in the Air Force GTWAPS Program Development Plan (PDP).
- *Program's verification process:* Spiral development acquisition strategy. Each spiral consists of a 12-month period at which time the government and contractor test against identified requirements. Configuration and functional audits were completed at Final Operational Capability (FOC).
- *Method used for end product validation:* Daily product verification takes place in-house. Operational Utility Evaluation which measures effectiveness and performance issues was performed prior to Initial Operational Capability (IOC).
- Operational training for the user: Both hands-on and text training materials are provided by the contractor to users to allow the government to make effective use of the system.

- Next major program milestone: N/A
- **Program becomes operational:** GTWAPS is an operational system.
- *Plans for further improvements:* Follow-on advanced development is anticipated as improvements to numerical modeling are developed and computer resources continue to improve. Follow-on improvements through technology refreshments and incremental technology insertions are planned through FY05 when MM5 will be replaced by the Weather Research and Forecasting Model (WRF).

Reengineered Enterprise Infrastructure Program (REIP)

PROGRAM/PROJECT:

<u>LEAD AGENCY</u>: Headquarters United States Air Force, Directorate of Weather (HQ USAF/XOO-W) <u>LEAD AGENCY POC</u>: HQ USAF/XOWR, 703-696-4930, DSN 426-4930, scats.xowr@pentagon.af.mil <u>PROGRAM POC</u>: Mr. Robert (Gene) Monroe, HQ AFWA/XPSI 402-294-9669, DSN 271-9669, robert.Monroe@afwa.af.mil

SERVICE AREA(S)/INITIATIVE(S)

 National Aviation Weather Initiatives: N/A

FUNDING

• Programmed/Planned (\$'s/FY): /FY03 /FY04

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: strategic weather production support for Air Force's Operational Weather Squadrons. REIP accomplishes the modernization of the Air Force Weather Agency (AFWA) Strategic Center. It provides infrastructure reuse components that can be used by other weather programs and the AF Weather Weapons System and establishes the framework for AFWA to support the Air Force's Operational Weather Squadrons. It modernizes system interoperability and common user communications, upgrades/reengineers hardware and software, and delivers a separate development, test, and production environment. REIP maximizes the use of COTS and resources from other METOC centers. It is consistent with the Joint Technical Architecture standards and provides Defense Information Infrastructure Common Operating Environment compliant architecture.
- How operations will be changed/improved: Modernization of the Air Force Weather Agency (AFWA) Strategic Center's data processing and communications infrastructure in order to reduce overhead to sustain the system and time to meet customer need. It will be interoperable with other METOC centers and with command and control systems, and will eliminate duplication across Air Force weather systems.

PROGRAM/PROJECT MANAGEMENT

- *Basic guidance document for this program:* USAF Mission Needs Statement 003-94, 15 May 95. Centralized Aerospace Weather Capability (CAWC) Operational Requirements Document, 29 Mar 01.
- Program's verification process: Design reviews and testing; Developmental Test & Evaluation; and FDE.
- Method used for end product validation: See above.
- Operational training for the user: Both hands on and text training manuals (user's manual, etc) are provided by the contractor. For software developers, program instructions are provided on software use and development tools, standard documentation approaches, and the process of receiving a requirement to implementing software.

- Next major program milestone: N/A
- When program will become operational: System became operational on 31 Jul 02.
- *Plans for further improvements:* Product and system improvements through FY11 will be handled through the Weather Data Analysis Capabilities (WDAC) and/or Joint Environmental Toolkit (JET) programs.

Space Weather Analysis and Forecast System (SWAFS)

PROGRAM/PROJECT:

<u>LEAD AGENCY</u>: Headquarters United States Air Force, Directorate of Weather (HQ USAF/XOO-W) <u>LEAD AGENCY POC</u>: HQ USAF/XOO-WR, 703-696-4930, DSN 426-4930, afxoowr@pentagon.af.mil **PROGRAM POC**: Mr. Jerry Reif, 402-294-9645, DSN 271-9645, gerald.reif@afwa.af.mil

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: N/A

FUNDING

• Programmed/Planned (\$'s/FY):

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: integration of space weather analysis and forecast capability into the Air Force Weather Agency (AFWA) strategic processing center. SWAFS Initial Spiral (IS) re-hosted software from the 55th Space Weather Squadron to AFWA platforms during FY 00-02.
- How operations will be changed/improved: Integrates space weather into the AFWA infrastructure and upgrades capabilities in space weather product production and dissemination. Provides capability to produce classified space weather products for dissemination.

PROGRAM/PROJECT MANAGEMENT

- *Basic guidance document for this program:* USAF Operational Requirements Document (USAF 003-94-I/II/III-C), 1 May 97.
- *Program's verification process:* System/Software Design and Test Readiness Reviews conducted for each delivery. Configuration and functional audits completed after each software delivery.
- *Method used for end product validation:* Verification and Validation of models and algorithms performed prior to turn-over to contractor for development and integration. Contractor conducts Qualification Test & Evaluation (QT&E) and HQ AFWA conducts Force Development Evaluation (FDE).
- Operational training for the user: Both hands-on and text training materials provided by the contractor to
 users to allow the government to make effective use and sustainment of the system. AFWA Help Desk
 personnel receive training provided by the contractor.

- Next major program milestone: N/A
- Program becomes operational: SWAFS Initial Spiral is currently operational.
- *Plans for further improvements:* The follow-on program provides incremental enhancements and upgrades for existing models and algorithms using current technology FY03-05 (Spiral 2) and future models and algorithms using new technology beginning FY06 (Spiral 3).

Volcanic Ash Dispersion Model (PUFF)

PROGRAM/PROJECT:

LEAD AGENCY: Headquarters United States Air Force, Directorate of Weather (HQ USAF/XOO-W) **LEAD AGENCY POC:** HQ USAF/XOO-WR, 703-696-4930, DSN 426-4930, afxoowr@pentagon.af.mil **PROGRAM POCS:** Lt Col Gene Layeski, AFWA/XOG 402-294-6004,DSN 271-6004,

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SERVICE AREA(S)/INITIATIVE(S)

National Aviation Weather Initiatives:8: 5, 6

FUNDING

Programmed/Planned (\$'s/FY):
 Funds provided by NCEP in Washington DC VAAC

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: volcanic ash dispersion modeling for the DoD, coupled with man-in-the-loop satellite interpretation; also provides backup services for the Washington, D.C. regional Volcanic Ash Advisory Centers (VAAC). Developed under the University Partnering for Operational Support (UPOS), this numerical model was developed jointly by University of Alaska and Johns Hopkins University. Presently, only the Washington, D.C. VAAC will receive back-up support.
- How operations will be changed/improved: provides up-to-date, three-dimensional, ash plume and propagation information with enhanced forecast accuracy and an intuitive graphical user interface. This will provide aircrews three dimensional ash cloud information allowing them to avoid hazardous areas during times of volcanic activity.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Cooperative Plan for Operational Support and agreement among FAA, NOAA, USGS, and USAF.
- *Program's verification process:* Model output verified against satellite imagery. Systems and development testing accomplished by the UPOS team. AFWA conducted integration and security testing.
- Method used for end product validation: See above.
- Operational training for the user: Both hands on and text training manuals (user's manual, etc) are provided by the contractor.

- Next major program milestone: N/A
- Program becomes operational: PUFF is an operational model.
- *Plans for further improvements:* Migrating to WRAPS-2 hardware platform in FY05.

Joint Weather Impacts System (JWIS)

PROGRAM/PROJECT:

LEAD AGENCY: Headquarters United States Air Force, Directorate of Weather (HQ USAF/XOO-W) **LEAD AGENCY POC:** HQ USAF/XOO-WR, 703-696-4930, DSN 426-4930, afxoowr@pentagon.af.mil **PROGRAM POCS:** Maj. Steve Renner, HQ AFWA/XPFT, 402-294-4233, DSN 271-4233, steven.renner@afwa.af.mil, Mr Jim Reardon, AFWA/XPFT, 402-292-4150, DSN 272-4150, james.reardon@afwa.af.mil

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: N/A

FUNDING

• Programmed/Planned (\$'s/FY):

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: web-based system that summarizes weather-driven performance predictions of various weapon systems against a range of targets. JWIS is designed to exploit advances in information technology while satisfying war fighter demand for specialized, timely, and accurate weather information.
- How operations will be changed/improved: enables predictive battle space awareness and allows for the display of war fighter impacts. JWIS will serve as the primary weather information link between all elements of an Aerospace Expeditionary Force (AEF).

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Requirements for this program are documented in Mission Needs
 Statement, USAF 001-94, Meteorological Operations Capability, 7 Mar 95 the Operational Requirements
 Document, USAF 006-00.
- **Program's verification process:** Developmental Test & Evaluation followed by Final Acceptance Testing of the software deliverable, and an Operational Assessment thereafter. Developmental software is demonstrated at the Joint Expeditionary Force Experiment (JEFX) and the Mission Planning User Conference (MPUC).
- *Method used for end product validation:* Standard Air Force weather models are the source of data. The threat rules are submitted by the services and incorporated into the software.
- *Operational training for the user:* Hands-on training is being provided by the JWIS contractor team to users/operators to allow the government to make effective use of the system.

- Next major program milestone: Integration into the Air Operations Center (AOC) Weapon System
- Program becomes operational: Provides interim capability for the AOC until subsumed by JET in FY05-07
- *Plans for further improvements:* Follow-on improvements through technology refreshments and incremental technology insertions are planned through FY09.

Improved Solar Observing Optical Network (ISOON)

PROGRAM/PROJECT: http://www.nso.edu/nsosp/isoon/description.html

LEAD AGENCY: Headquarters United States Air Force, Directorate of Weather (HQ USAF/XOO-W)

LEAD AGENCY POC: HQ USAF/XOO-WR, 703-696-4930, DSN 426-4930

PROGRAM POC: Jim Manley, Air Force Weather Agency, AFWA/XPFC, 402-294-9680, DSN 271-9680, james.manley@afwa.af.mil; David Edgington, SMC/Det 11, DSN 834-2877, david.edgington@cisf.af.mil

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: N/A

FUNDING

Programmed/Planned (\$'s/FY): /FY03 /FY04

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: ISOON is a semi-autonomous, remotely commandable patrol telescope designed for studies of solar activity in support of space weather specifications and forecasts. ISOON is designed to replace the existing Solar Observing Optical Network (SOON), which USAF currently operates as a world-wide network of 4 telescopes for monitoring solar activity. Both SOON and ISOON provide data that support a wide variety of users of space weather specifications and forecasts.
- How operations will be changed/improved: ISOON detects solar flares as well as magnetic field signatures
 and sunspot groups that are known to lead to flares and other eruptive activity. Numerous communication,
 navigation, and surveillance systems operated by DOD and civilian agencies are adversely affected by solar
 activity.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: N/A
- Program's verification process: N/A
- Method used for product validation: N/A
- Operational training for the user: Operator & maintenance courses conducted at Holloman AFB.

- Next major program milestone: Program completed, no further development projected
- *Program becomes operational:* The prototype instrument was completed and demonstrated in 2002. Due to programmatic decisions, ISOON is presently planned to be operated by Air Force Research Laboratory at a single site (Sacramento Peak) for research and limited support to space weather operations.
- Plans for further improvements: Program completed, no further development projected

Digital Ionospheric Sounding System (DISS)

PROGRAM/PROJECT:

LEAD AGENCY: Headquarters United States Air Force, Directorate of Weather (HQ USAF/XOO-W) **LEAD AGENCY POC:** HQ USAF/XOO-WR, 703-696-4930, DSN 426-4930, afxoowr@pentagon.af.mil **PROGRAM POC:** Jim Manley, Air Force Weather Agency, AFWA/XPFC, 402-294-9680, DSN 271-9680, james.manley@afwa.af.mil

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: N/A

FUNDING

• Programmed/Planned (\$'s/FY):

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: upgrades to the existing Digital Ionospheric Sounding System that
 collects real-time Ionospheric data used to prepare specifications and forecasts for communications, navigation,
 and surveillance systems.
- How operations will be changed/improved: improved system availability and consequently improved specification of ionospheric parameters affecting DOD communication, navigation, and surveillance systems.

PROGRAM/PROJECT MANAGEMENT

- *Basic guidance document for this program:* Environmental Sensing Mission Need Statement (MNS) and Program Management Directive (PMD) 6250 (3), 16 Jun 88.
- Program's verification process: N/A.
- *Method used for product validation:* N/A.
- Operational training for the user: N/A.

- *Next major program milestone:* Initiation of modification in FY04.
- **Program becomes operational:** DISS is currently operational.
- Plans for further improvements:

Radio Solar Telescope Network (RSTN)

PROGRAM/PROJECT:

LEAD AGENCY: Headquarters United States Air Force, Directorate of Weather (HQ USAF/XOO-W) **LEAD AGENCY POC:** HQ USAF/XOO-WR, 703-696-4930, DSN 426-4930, afxoowr@pentagon.af.mil **PROGRAM POC:** Jim Manley, Air Force Weather Agency, AFWA/XPFC, 402-294-9680, DSN 271-9680, james.manley@afwa.af.mil; Trinidad Medel, SMC/Det 11, DSN 834-9478, Trinidad.medel@cisf.af.mil

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: N/A

FUNDING

• Programmed/Planned (\$'s/FY):

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: prototype replacement for fixed frequency component of system.
- How operations will be changed/improved: potential increase in capability to monitor/report solar radio frequency interference affecting DoD communications and surveillance.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: USAF Statement of Need (SON) 015-85, USAF System Operational Requirements Document (SORD) 015-85-1A, HQ AFSPC 035-92 Environmental Sensing Mission Need Statement (MNS), 8 Jan 93, HQ AFSPC/DRF Operational Requirements Document for the Solar Radio Burst Locator (SRBL), 3 Sep 99. Program Management Directive (PMD 6250 (3), 16 Jun 88, Program Directive: Air Force Weather Weapons Systems (AFWWS), PMD 2326(5)/ PE0305111F, dated 19 Jan01.
- *Program's verification process:* Engineering drawing verification. Field testing using comparisons with original prototype.
- Method used for product validation: Comparison with other sources of solar radio burst observations.
- *Operational training for the user:* Initial hands on training with installed prototype.

- Next major program milestone: N/A
- Program becomes operational: Following successful test and procurement of remaining network ~ FY06
- Plans for further improvements: Potential antenna replacements to reduce system costs.

Ionospheric Measuring System (IMS)

PROGRAM/PROJECT:

<u>LEAD AGENCY</u>: Headquarters United States Air Force, Directorate of Weather (HQ USAF/XOO-W) <u>LEAD AGENCY POC</u>: HQ USAF/XOO-WR, 703-696-4930, DSN 426-4930, afxoowr@pentagon.af.mil <u>PROGRAM POC</u>: Jim Manley, Air Force Weather Agency, AFWA/XPFC, 402-294-9680, DSN 271-9680, james.manley@afwa.af.mil; SMC/Det 11, DSN 834-2089, William.bascue@cisf.af.mil

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: N/A

FUNDING

• Programmed/Planned (\$'s/FY):

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: L-Band and UHF satellite receivers to measure ionospheric total electron content (TEC) and scintillation.
- How operations will be changed/improved: improved identification of areas of degraded GPS signal reception and degraded satellite communication signal receipt.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: MAC Statement of Need (SON) 2-80, (updated 16 Feb 86); HQ AFSPC 035-92, Environmental Sensing Mission Need Statement (MNS), 8 Jan 93. Program Management Directive (PMD) 6250 (3), 16 Jun 88, Program Directive: Air Force Weather Weapons Systems (AFWWS), PMD 2326(5)/ PE0305111F, dated 19 Jan01.
- Program's verification process: N/A
- Method used for product validation: N/A
- Operational training for the user: N/A.

SCHEDULE/IMPLEMENTATION

Next major program milestone: N/A
 Program becomes operational: TBD

Plans for further improvements: N/A

Weather Data Analysis Capabilities (WDAC)

PROGRAM/PROJECT:

<u>LEAD AGENCY</u>: Headquarters United States Air Force, Directorate of Weather (HQ USAF/XOW) **LEAD AGENCY POC:** HQ USAF/XOWR, 703-696-4930, DSN 426-4930, scats.xowr@pentagon.af.mil

PROGRAM POC: Maj. Steven Christy, HQ AFWA/XPSA 402-294-4175, DSN 271-4175,

Steven.Christy@afwa.af.mil

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: N/A

FUNDING

• Programmed/Planned (\$'s/FY): /FY03 /FY04

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: modernization of strategic weather center production support for Air Force's Operational Weather Squadrons. It modernizes system interoperability and common user communications, upgrades/reengineers hardware and software, and delivers a separate development, test, and production environment. WDA capabilities must be able to receive and process worldwide information in support of the analysis, forecasting, tailoring, and dissemination of strategic center products. Ultimately, WDAC provides a fused analysis of the atmosphere for theater and tactical customers, and it provides infrastructure components for reuse across the entire AF Weather Weapon System (AFWWS).
- How operations will be changed/improved: a modernization of the Air Force Weather Agency (AFWA) Strategic Center's data processing and communications infrastructure will reduce overhead to sustain the system and to meet customer needs. WDA will create an open, distributed virtual Joint Meteorological and Oceanographic (METOC) database to provide users access to weather-related information anywhere in the world, and will form the cornerstone of the future AFW architecture. It will also develop and reengineer software to an object-oriented environment (leveraging additional data sources) and upgrade dissemination/ingest hardware.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: USAF Mission Needs Statement 003-94, 15 May 95. Centralized Aerospace Weather Capability (CAWC) Operational Requirements Document, 12 March 01.
 Program's verification process: Will use design reviews, COTS Usage Risk Evaluation (CURE), and testing (DT/QT, FDE, etc).
- Method used for end product validation: (See above).
- *Operational training for the user:* Both hands-on and text training manuals (user's manual, etc.) are provided by the contractor.

- Next major program milestone: Increment 2 FDE begins Nov 04; Increment 3 on contract May 04.
- Program becomes operational: First operational date was Sep 03.
- *Plans for further improvements:* Product and system improvements through FY11. Next major improvements in increment 3 and beyond: Development and implementation of the Consolidated Dissemination Capability, completion of all Joint METOC database segments, creation of a System Health and Monitor System, and developing a Common Satellite Ingest System.

Mountain Wave Forecast Model (MWFM)

PROGRAM/PROJECT: Mountain Wave Forecast Model (MWFM)

LEAD AGENCY: United States Navy (USN – Naval Research Laboratory)

LEAD AGENCY POINT OF CONTACT: Dr. Stephen Eckermann, Naval Research Laboratory, 202-404-1299,

Stephen.Eckermann@nrl.navy.mil

PROGRAM POINT OF CONTACT: Dr. Stephen Eckermann, Naval Research Laboratory, 202-404-1299,

Stephen.Eckermann@nrl.navy.mil

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives:

7: 10

FUNDING

• *Programmed/Planned* (\$'s/FY): FY05 Funding to be determined.

TYPE OF PROGRAM/APPLICATION

Research and Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: a numerical model that uses developmental algorithms to forecast fine-scale zones of turbulence caused by breaking wind flow waves due to mountainous terrain. The current model, MWFM 2.0, includes better descriptions of 3D wave propagation, breakdown, and improved wave field descriptions near the topographic source.
- *How operations will be changed/improved:* fine scale turbulence forecasts will enable aircraft to avoid turbulent areas with greater accuracy. The success of this program is expected to result in significant reductions in personal injury and aircraft damage attributed to turbulence encounters.

PROGRAM/PROJECT MANAGEMENT

- *Basic guidance document for this program:* http://uap-www.nrl.navy.mil/dynamics/html/mwfm.html: see also Eckermann, S. D., Climatology for mountain wave-induced turbulence in the stratosphere over Central Asia: October-December 1994-2001, Naval Research Laboratory Technical Memorandum. NRL/MR/7640-02-8594, May 24, 2002.
- *Program/Project verification process:* Validation with PIREPS and in situ aircraft data acquired during mission flights.
- Method used for end product validation: Post-analysis of forecast case studies using data collected from
 aircraft and satellites. Also, conducting comparisons of forecasts with reports of turbulence from selected
 flights.
- Operational training for the user: Being conducted at Air Force Institute of Technology in test formulations.

- *Next major program milestone:* To be determined.
- **Program becomes operational:** MWFM has been run in campaign support for NASA airborne missions and for Air Force during Operations Enduring Freedom and Iraqi Freedom. Several forecast/assessment tests of MWFM have been performed at the Air Force Institute of Technology, in collaboration with Air Force Weather Agency, and code has been recommended in latest report for transition to AFWA.
- *Plans for further improvements:* Working on new 3D Fourier-ray code was next-generation dynamical core for use with arbitrary topography.

Navy Aerosol Analysis and Prediction System (NAAPS)

PROGRAM/PROJECT: Navy Aerosol Analysis and Prediction System (NAAPS)

LEAD AGENCY: United States Navy (USN - Naval Research Laboratory)

<u>LEAD AGENCY POINT OF CONTACT</u>: Dr. Douglas L. Westphal, Naval Research Laboratory, 831-656-4743, westphal@nrlmry.navy.mil

PROGRAM POINT OF CONTACT: Dr. Douglas L. Westphal, Naval Research Laboratory, 831-656-4743, westphal@nrlmry.navy.mil

SERVICE AREA (S):INITIATIVE (S)

• National Aviation Weather Initiatives: 1: 1 8: 1

FUNDING

• *Programmed/Planned* (\$'s/FY): FY05/\$550K FY06/\$500K FY07/\$500K

TYPE OF PROGRAM/APPLICATION

Research and Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: A global, multi-component analysis and forecast capability will produce aerosol products from model forecasts, satellite data and surface-based aerosol measurements.
- How operations will be changed/improved: Improve the forecast and nowcast of visibility restrictions caused by aerosols including those related to dust, smoke and pollutants. The success of this program is expected to result in a significant increase in the effectiveness of strike warfare and a significant increase in the safety of aircraft operations and ship navigation.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Overall guidance comes from a scientific and technical team from NRL as well as feedback from operators
- Program/Project verification process: Annual and semi-annual reviews by sponsoring agencies.
- *Method used for end product validation:* Post-analysis of forecast case studies and statistical comparison with data from satellite and surface site; publication in peer-reviewed literature.
- *Operational training for the user:* The Naval Research Laboratory/Monterey web site provides details on interpreting the aerosol products. Operational training will be addressed when NAAPS transitions to operations.

- *Next major program milestone:* Will be transitioned to Milestone II in FY05.
- *Program becomes operational:* Expected to become operational at FNMOC in FY05.
- *Plans for further improvements:* Continued ONR 6.2 funding will allow further improvements such as addition of salt and organic carbon aerosol components and increased resolution.

Automated Surface Observing System (ASOS)

PROGRAM/PROJECT: Automated Surface Observing System (ASOS)

LEAD AGENCY: United States Navy (USN - Office of the Oceanographer of the Navy (CNO N61))

LEAD AGENCY POINT OF CONTACT: CDR William Nisley, CNO N61R, 703-601-5094,

william.nisley@navy.mil

PROGRAM POINT OF CONTACT: Mr. Carl Robbins, PEO C4I & Space, ISR/IO (PMW-180), 619-524-7700; Mr. Tim Kimbrell, SPAWARSYSCEN CHAS J665, 843-218-5813

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives:

1: 5, 7 **2:** 5 **4:** 2 **6:** 6

FUNDING

• *Programmed/Planned* (\$'s/FY): Funded through FY05.

TYPE OF PROGRAM/APPLICATION

Product Improvement

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: The Automatic Surface Observing System (ASOS) was developed by the National Weather Service (NWS) and the Federal Aviation Administration (FAA) as a cost-effective way of replacing human weather observers without diminishing the capability to provide pilots and other end users with critical near-real time weather observation data. There are currently 71 operational units installed at Navy and Marine Corps facilities around the world. Pre-Planned Product Improvements (P³I) are scheduled to include a new ACU processor, dew point sensor, ice-free wind sensor, enhanced precipitation sensor and ceilometer from FY04 through FY09.
- How operations will be changed/improved: Supporting Commander Naval Meteorology and Oceanography
 Command's Guidance on CONUS Aviation Realignment, Naval ASOS configuration will be normalized with
 NWS/FAA in order to allow unattended observations at selected sites. Maintainability of the system will be
 improved through higher MTBF and reduced periodic maintenance.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Engineering Change Proposals based on the NWS ASOS Product Improvement Master Implementation Plan will guide the upgrades. Basic requirements for this program are documented in the Navy's Operational Requirements of May 91.
- Program/Project verification process: This program has completed milestone III and is currently undergoing
 post-production improvements. The NWS ASOS Program Management Committee (APMC) has overall
 responsibility for program verification and all Requests for Change (RC) will be managed through the
 subordinate ASOS Configuration Control Board (ACCB).
- *Method used for end product validation:* NWS will conduct system testing (ST) and operational acceptance testing (OAT) for all upgrades.
- Operational training for the user: Hands-on training and/or text training materials will be provided to users.

- *Next major program milestone:* Deployment of the processor upgrade, dew point replacement and ice-free wind sensor will begin FY05. Normalization with NWS/FAA configuration is expected by FY06.
- Program becomes operational: ASOS is an operational system.
- *Plans for further improvements:* Future improvements are planned according to the NWS ASOS Product Improvement Program.

Supplemental Weather Radar (SWR)

PROGRAM/PROJECT: Supplemental Weather Radar (SWR)

LEAD AGENCY: United States Navy (USN - Office of the Oceanographer of the Navy (CNO N61))

LEAD AGENCY POINT OF CONTACT: CDR William Nisley, CNO N61R, 703-601-5094,

william.nisley@navy.mil

PROGRAM POINT OF CONTACT: Mr. Carl Robbins, PEO C4I & Space, ISR/IO (PMW-180), 619-524-7700; Mr. Tim Kimbrell, SPAWARSYSCEN CHAS J665, 843-218-5813

SERVICE AREA (S)/INITIATIVE (S)

National Aviation Weather Initiatives:
2: 5, 9

FUNDING

• *Programmed/Planned* (\$'s/FY): Funded through FY05.

TYPE OF PROGRAM/APPLICATION

Product Improvement

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: The AN/FPS-131 Meteorological Data Radar Set (or Supplemental Weather Radar; SWR) is a shore station Doppler weather radar. The SWR provides real-time surveillance and advanced warning of potentially severe weather systems. A total of 10 SWRs have been procured and installed. Pre-Planned Product Improvements (P³I) scheduled include: replacement of the aging Enterprise Doppler Graphics Environment (EDGE) workstation, purchase of additional end products for users and replacement of the analog Radar Controller Processor.
- How operations will be changed/improved: SWR is designed for use by Department of Navy facilities that lie outside the umbrella of, or require an alternative to, the Next Generation Radar (NEXRAD; WSR-88D).
 Upgrades are required due to parts obsolescence and will improve maintainability of the system.

PROGRAM/PROJECT MANAGEMENT

- *Basic guidance document for this program:* Requirements Document: CNO Mission Needs Statement (MNS) M041-096-93 of 1 Oct 93. Operational Requirements Document (ORD) 431-096-96 of 12 Mar 96.
- *Program/Project verification process:* This program has received milestone III production decision in 1997 and Full Operational Capability (FOC) was completed in Aug 2002.
- *Method used for end product validation:* Factory and Site Acceptance Testing (FAT and SAT) is conducted for each production system delivered.
- *Operational training for the user:* The contractor provided both hands-on and textual initial training during installation. Factory training is available on a cost-reimbursement basis.

- *Next major program milestone:* The program is at FOC and post-production support is ongoing. EDGE workstation replacement will be complete by FY05 Q2.
- **Program becomes operational:** SWR is an operational system.
- *Plans for further improvements:* Replacement of the analog Radar Control Processor (RCP) with a digital RCP is planned for FY06-FY07.

Naval Integrated Tactical Environmental Subsystem (NITES)

PROGRAM/PROJECT: Tactical Environmental Support System/Navy Integrated Tactical Environmental Subsystem, AN/UMK-4(V)

LEAD AGENCY: United States Navy (USN – Office of the Oceanographer of the Navy (CNO N61))

LEAD AGENCY POINT OF CONTACT: CDR Steve Rutherford, CNO N61R, 703-601-1287,

steven.j.rutherford@navy.mil

PROGRAM POINT OF CONTACT: Ms. Martha Yacoub, PEO C4I & Space, ISR/IO (PMW-180) 858-537-8635, martha.yacoub@navy.mil

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives: N/A

FUNDING

• **Programmed/Planned (\$'s/FY):** Funded through FY05.

TYPE OF PROGRAM/APPLICATION

Product Improvement

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: Improvements for data receiving, storing, processing, display, and communication. GOTS/COTS hardware upgrades. NITES II Object-Oriented Re-design and upgrades to all the Meteorological/Oceanographic (MetOc) Tactical Decision Aids. Data services aligned with DoD netcentric initiatives (e.g. Global Information Grid Enterprise Services (GIG-ES).
- How operations will be changed/improved: Improved support to detect, monitor and assess the conditions of the physical environment from the bottom of the seabed to the top of the atmosphere. This includes decision tools to aid decision-makers' (warfighters') weapon, sensor, communication, and ISR systems performance.

PROGRAM/PROJECT MANAGEMENT

- *Basic guidance document for this program:* Operational Requirements Document for TESS/NITES (369(01)-096-99). Acquisition Decision Memorandum (2) 22 Dec 99 and 08 Apr 00.
- *Program/Project verification process:* Annual Program Reviews. SPAWAR System Center San Diego Code 2642: MetOc System Lab Integration & Testing, METOC Systems Knowledge Center (MSKC) 24/7 support.
- Method used for end product validation: Standardized Systems Operation and Verification Test (SOVT)
 (ashore/afloat), and mobile system, METOC Systems Knowledge Center (MSKC) provides 24/7 support and
 receives customer service requests.
- *Operational training for the user:* NITES System Operators Course and Operator training the Professional Development Detachments San Diego, CA and Norfolk, VA

- *Next major program milestone:* Post Milestone C (Production, Fielding/Deploying and Operational Support) to continue and ECP HW obsolescence and SW upgrades. Upgrade demonstration in NETWARCOM/SPAWAR Trident Warrior 04 (TW04), Oct 2004
- **Program becomes operational:** NITES variants are operational systems.
- Plans for further improvements: Web-services technology for applications and data services (TEDServices) to improve METOC data acquisition, assimilation, application and distribution. Continue upgrade of GOTS/COTS hardware and software applications.

Tactical Environmental Data Services (TEDServices)

PROGRAM/PROJECT: Tactical Environmental Data Services (TEDServices)

LEAD AGENCY: United States Navy (USN – Office of the Oceanographer of the Navy (CNO N61))

LEAD AGENCY POINT OF CONTACT: CDR Steve Rutherford, CNO N61R, 703-601-1287,

steven.j.rutherford@navy.mil

PROGRAM POINT OF CONTACT: Mr. Carl Robbins, PEO C4I & Space, ISR/IO (PMW-180), 619-524-7700, carl.robbins@navy.mil; Mr. John J. Shea, PEO C4I & Space, ISR/IO (PMW-180), APM Data Services, 619-524-7880, john.shea@teds.navy.mil

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives: N/A

FUNDING

• *Programmed/Planned* (\$'s/FY): Funded through FY05.

TYPE OF PROGRAM/APPLICATION

Product Improvement

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: TEDServices is a revolutionary new, scaleable and modular web services environmental data repository (4D Cube) designed to support joint warfighters, weapon systems, and expert Meteorology and Oceanography (MetOc) data users. It includes a middleware infrastructure that enables the bi-directional interoperable transport and transform of data, consistent with WGS84 datum and Universal Time Coordinate (UTC) facilitated by a MetOc/Mission Rules Based Relevant Data Ordering scheme.
- *How operations will be changed/improved:* TEDServices operational objective is to reduce bandwidth consumption by 70% by employing improvements in data representation/organization, data transport and data ordering.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: N096 Operational Concept dated April 2002.
- *Program/Project verification process:* TEDServices is currently being developed under the NITES/TESS(NC) program of record, and a product improvement effort.
- Method used for end product validation: TEDServices is currently in development and is slated for transition
 (as part of NITES) in FY05 as an embedded data services for NITES-Next, Undersea Warfare Decision
 Support System (USW-DSS), Tactical Undersea Warfare (TUSW) and ASQ-20 Rapid Transition Proposals
 (RTPs).
- *Operational training for the user:* A contractor will be selected to perform project/product transition in FY05. The contractor will provide training during installation. Post installation support and training will be provided by the NITES ISEA, SPAWAR-SSC (Code S2642).

- *Next major program milestone:* Operational testing with Trident Warrior 04 (TW04), Undersea Dominance 04 (UD04), and transitioned into NITES-Next and USW-DSS during FY05.
- *Program becomes operational:* Fourth quarter, FY05.
- *Plans for further improvements:* TEDServices will continue to evolve; incorporating new data sources and data types and support netcentric tenets of FORCEnet and Global Information Grid Enterprise Services (GIG-ES).

Meteorology and Oceanography (METOC) Portal

PROGRAM/PROJECT: Meteorology and Oceanography (METOC) Portal

LEAD AGENCY: United States Navy (USN - Commander, Naval Meteorology and Oceanography Command (CNMOC))

<u>LEAD AGENCY POINT OF CONTACT</u>: Mr. John Meyer, N6, 228-688-5228, meyerj@cnmoc.navy.mil **PROGRAM POINT OF CONTACT: Mr.** Bill Kerr, FNMOC, 831-656-4420, william.kerr@fnmoc.navy.mil

SERVICE AREA(S)/INITIATIVE (S)

• National Aviation Weather Initiatives: N/A

FUNDING

• Programmed/Planned (\$'s/FY): FY05/\$300K FY06/\$300K FY07/\$150K

TYPE OF PROGRAM/APPLICATION

Product Dissemination

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: Development and hosting environment to support the Navy Enterprise
 Portal. Infrastructure services, including authentication, and user customization will be provided. Will host a
 METOC Professional Portal for the integrated presentation of METOC information on the Web from different
 Centers and sources. The METOC Professional Portal will also serve as a testing and proving ground for
 migration of applications to the Navy Enterprise Portal.
- How operations will be changed/improved: A critical element in the development of FORCEnet is the
 implementation of the Web-Enabled Navy. The Navy Enterprise Portal provides the enterprise infrastructure for
 accessing Web services using technologies, which enable users to access applications and data from any
 computer with a Web browser such as Internet Explorer or Netscape Navigator.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Navy Enterprise Application Developers Guide (V 2.0 draft).
- Program/Project verification process: N/A
- *Method used for end product validation:* Customer feedback and iterative development is planned for product validation.
- *Operational training for the user:* Operation will be intuitive and not require specialized training. Individual applications may require training but this will be the responsibility of the application owner.

- *Next major program milestone:* Beta testing Nov 2004.
- **Program becomes operational:** Jan 2005.
- Plans for further improvements: Iterative improvements based on customer feedback.

Remote Automated Weather Sensor (RAWS)

PROGRAM/PROJECT: Remote Automated Weather Sensor (RAWS)

<u>LEAD AGENCY</u>: United States Navy (USN – Commander, Naval Meteorology and Oceanography Command (CNMOC)/Naval Oceanographic Office (NAVO))

LEAD AGENCY POINT OF CONTACT: Mr. John Meyer, N6, 228-688-5228, meyerj@cnmoc.navy.mil **PROGRAM POINT OF CONTACT:** Mr. Charleston Simms, 228-688-4485, simmsc@navo.navy.mil; Mr. Sam Naquin, 228-688-5708, naquins@navo.navy.mil

SERVICE AREA (S)/INITIATIVE (S)

National Aviation Weather Initiatives:
1: 7

FUNDING

• *Programmed/Planned (\$'s/FY):* FY05/100K FY06/\$106K FY07/\$113K

TYPE OF PROGRAM/APPLICATION

Product development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: Fixed, shore-based sensor suite to collect remote environmental data that communicates back to regional site that will store and process the data.
- *How operations will be changed/improved:* Improves the ability of a weather office to forecast for a remote, data-sparse area.

PROGRAM/PROJECT MANAGEMENT

- *Basic guidance document for this program:* Sponsor (CNMOC) and NAVO approved Project Management Plan. Future install locations are determined from sponsor's requirement collection.
- *Program/Project verification process:* Requirement Trace Matrix (RTM) used to ensure that requirements that were designated for the system are included within the implementation phase of the project.
- *Method used for end product validation:* A Systems Operation and Verification Test (SOVT) is performed at completion of installation to ensure that all that was intended to be installed is functioning and is what was originally planned.
- Operational training for the user: A combination of training during installation and system administrator training occurs after the installation. Additional training materials are included in distribution media (i.e. vendor documentation).

- Next major program milestone: Explore new telemetry options.
- **Program becomes operational:** RAWS is an operational system.
- *Plans for further improvements:* Centralized data collection and transmission to local web servers, thereby eliminating most of the system administrative tasks at the RAWS sites. Cellular technology to improve data communication in European Theater. Also, inclusion of camera system to give a visual, panoramic, representation of the surroundings.

Naval Flight Weather Briefer (NFWB) Web

PROGRAM/PROJECT: Naval Flight Weather Briefer (NFWB) Web

LEAD AGENCY: United States Navy (USN - Commander, Naval Meteorology and Oceanography Command (CNMOC))

LEAD AGENCY POINT OF CONTACT: Mr. John Meyer, N6, 228-688-5228, meyerj@cnmoc.navy.mil **PROGRAM POINT OF CONTACT:** Mr. Greg Noll, NAVO N641, 228-688-4054, nollg@navo.navy.mil

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: TBD

FUNDING

Programmed/Planned (\$'s/FY):

FY05/\$260K (Three-Phased Release Project)

FY06/ \$50K (Transition to SPAWAR PMW-180 by Second Quarter FY06)

FY07/\$0 (Transitioned to SPAWAR PMW-180)

TYPE OF PROGRAM/APPLICATION

Product Development, Life Cycle Engineering, and Maintenance.

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: Web-based aviation flight weather briefing applications accessible
 through Internet or NIPRNet connections. NFWB-Web includes a function in which the forecaster can
 designate web links to aviation products that are viewable simultaneously by pilot and forecaster resulting in a
 common set of products viewed remotely during telephonic briefings.
- How operations will be changed/improved: NFWB-Web provides a totally electronic and remote means of
 providing aviation flight weather briefings to pilots worldwide through three CONUS regional web and data
 servers. Additionally, NFWB-Web will soon interface with AISR to allow Base Operations offices to
 electronically transfer flight plan data directly to the FAA.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Sponsor (COMNAVMETOCCOM) approved Project
 Management Plan. Technical guidance provided through NAVMETOCCOM Instruction 3140.14E, Procedures
 Governing Flight Weather Briefings and OPNAV Instruction 3710.7T, NATOPS General Flight and Operating
 Instructions.
- *Program/Project verification process:* Requirements Specifications and Trace matrix validation and verification by ISEA (NAVO) with concurrence from both the Sponsor (COMNAVMETOCCOM) and the end user.
- *Method used for end product validation:* End product validation is accomplished via requirements tracking and validation, development, integration, system testing, configuration management processes, documentation, baseline validation, and system and software life cycle support. NAVO N64 follows Industry Software Engineering processes and practices in accordance with their Capability Maturity Model Level 3 Certification.
- Operational training for the user: Operational training for all end users (to include System Administrator and Operator training) at international sites was conducted during initial system deployment. Additional training is conducted upon each system hardware/software upgrade. Training materials, User's Guides, System Administrator Guides and other documentation are provided on CD-ROM with each version release and can be downloaded from the METOC Systems Knowledge Center (MSKC) web site.

- *Next major program milestone:* The next release (NFWB-Web Version 5) is expected to be deployed in a three-phased "*Spiral*" software engineering process as follows:
 - Phase I (December 2005) New Policy and Functionality
 - Phase II (June 2005) Security and Interoperability Issues
 - Phase III (November 2005) Standards Compliance Issues
- **Program becomes operational:** NFWB-Web is currently operational. Anticipate CNAF concurrence, expanding the NFWB-Web mandate to Navy pilots by October 2004.
- Plans for further improvements:
 - Continue 6-month upgrade cycle through FY05.

Naval Satellite Display System-Enhanced (NSDS-E) (AN/FMQ-17)

PROGRAM/PROJECT: Naval Satellite Display System-Enhanced (NSDS-E)/AN/FMQ-17 **LEAD AGENCY:** United States Navy (USN - Office of the Oceanographer of the Navy (CNO N61)) **LEAD AGENCY POINT OF CONTACT:** CDR Steve Rutherford, CNO N61, 703-601-1287, steven.j.rutherford@navy.mil

PROGRAM POINT OF CONTACT: CDR Eric Gottshall, PEO C4I & Space, ISR/IO (PMW-180), 301-713-4809, eric.gottshall@noaa.gov and Mr. Michael R. Fisher, PEO C4I & Space, SATCOMMS (PMW-170), 619-524-7153, michael.fisher@navy.mil

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives:

FUNDING

• *Programmed/Planned* (\$'s/FY): Funded through FY05.

TYPE OF PROGRAM/APPLICATION

Product Improvement

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: Upgrades to an operational system that include new algorithms for satellite data. Specific products include dust storm tracking and forecasting, fire detection, cloud phase, atmospheric sounding, and a tropical storm analysis tool. Additionally, new satellite feeds for selected OCONUS systems to support new data rates at Yokosuka Japan, Bahrain, Diego Garcia and Rota Spain.
- How operations will be changed/improved: Improve environmental support to Navy operations.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Abbreviated System Decision Paper (ASDP).
- Program/Project verification process: Annual program reviews.
- *Method used for end product validation:* Standardized Systems Operations and Verification Testing (SOVT) for the AN/FMQ-17.
- *Operational training for the user:* Users are provided training at the Navy Technical Training Unit, Keesler AFB and by contractor. On-the-job training is also conducted at shore facilities.

- Next major program milestone: Installation of next minor software release is scheduled for Second Quarter, FY05.
- *Program becomes operational:* NSDS-E/AN/FMQ-17 is an operational system.
- *Plans for further improvements:* X-band enhancement at selected sites. Currently at Rota and Bahrain. Future installations TBD per METOC CONOPS. Selected sites also to receive (pending funding) LINIX upgrades to SUN-Blade CPU's. JTWC is currently jointly funded by AF and CNMOC for this upgrade in FY 05.

Meteorological Mobile Facility - Next Generation (METMF-NG)

PROGRAM/PROJECT: Meteorological Mobile Facility – Next Generation (METMF-NG)

LEAD AGENCY: United States Navy (USN - Office of the Oceanographer of the Navy (CNO N61))

LEAD AGENCY POINT OF CONTACT: CDR Steve Rutherford, CNO N61R, 703-601-1287,

steven.j.rutherford@navy.mil

<u>PROGRAM POINT OF CONTACT</u>: Captain Jay Haley, USMC, PEO C4I & Space, ISR/IO (PMW-180), 858-537-0168, jay.haley@navy.mil

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives: N/A

FUNDING

Programmed/Planned (\$'s/FY): TBD.

TYPE OF PROGRAM/APPLICATION

Product Improvement

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: Meteorological Mobile Facility Replacement (METMF-R) replaced legacy four-van system with a one-van system (on-site footprint reduced by 75%). However, METMF-R is not easily relocatable and does not provide the "On the Move" capability USMC desires. FY05 resources provided to complete an analysis of alternatives for potential rapid prototyping. Joint service solution is sought.
- How operations will be changed/improved: Improved environmental support to the deployed Marine Air Ground Task Force (MAGTF) and increased flexibility to develop a more complete theater environmental sensing strategy.

PROGRAM/PROJECT MANAGEMENT

- *Basic guidance document for this program:* Mission area initial capabilities document (ICD) for Department of Defense Meteorology and Oceanography (MetOc) support operations needs to be developed. Operational Requirements Document #441-096-96 (METMF-R) may provide prerequisite baseline information for a "system specific" capability development document (CDD) and capability program document (CPD) for METMF-NG.
- Program/Project verification process: TBD.
- Method used for end product validation: Operational Test and Evaluation conducted as part of development process.
- *Operational training for the user:* Training provided at system delivery.

- Next major program milestone: TBD.
- Program becomes operational: TBD.
- Plans for further improvements: TBD.

Open Principal User Processor (OPUP)

PROGRAM/PROJECT: Next Generation Radar (NEXRAD) Open Principal User Processor (OPUP) **LEAD AGENCY:** United States Navy (USN - Office of the Oceanographer of the Navy (CNO N61)) **LEAD AGENCY POINT OF CONTACT:** CDR William Nisley, CNO N61R, 703-601-5094, william.nisley@navy.mil

PROGRAM POINT OF CONTACT: Mr. Carl Robbins, PEO C4I & Space, ISR/IO (PMW-180), 619-524-7700; Mr. Tim Kimbrell, SPAWARSYSCEN CHAS J665, 843-218-5813

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives: N/A

FUNDING

Programmed/Planned (\$'s/FY): Funded through FY05.

TYPE OF PROGRAM/APPLICATION

Product Improvement

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: Replacement of the WSR-88D Principal User Processor (PUP) at Navy and Marine Corps air stations. Additionally, three medium OPUPs and one large OPUP will be installed at Navy and Marine Corps regional aviation hubs.
- *How operations will be changed/improved:* An improved graphical user interface and a capability to provide multiple dedicated connections from a common workstation and rapid access to convective hazard information.

PROGRAM/PROJECT MANAGEMENT

- *Basic guidance document for this program:* Requirements for this upgrade are documented in the SPAWAR Engineering Change Proposal N65236-315-0301 based upon NWS ECP 0163.
- *Program/Project verification process:* Spiral development acquisition strategy through the Air Force Weather Agency (AFWA) as lead DOD agency. This includes Developmental Test and Evaluation, System Testing, and Field Testing.
- *Method used for end product validation:* NWS Radar Operations Center (ROC) will evaluate system performance against specified requirements under Air Force management.
- Operational training for the user: Hands-on and text training are provided as well as on-site instruction during installation.

- *Next major program milestone:* Three medium and one large OPUPs will become operational during Second Quarter, FY05.
- *Program becomes operational:* OPUP is an operational system. Deployment of navy small OPUPs was completed during Nov 03 to Jul 04.
- *Plans for further improvements:* Investigate alternate means of communications to Radar Product Generators (RPGs) to lower recurring costs.

Numerical Weather Prediction (NWP)

PROGRAM/PROJECT: Numerical Weather Prediction (NWP)

LEAD AGENCY: United States Navy (USN - Commander, Naval Meteorology and Oceanography Command (CNMOC))

<u>LEAD AGENCY POINT OF CONTACT</u>: Mr. John Meyer, N6, 228-688-5228, meyerj@cnmoc.navy.mil <u>PROGRAM POINT OF CONTACT</u>: Mr. Mike Clancy, FNMOC, 831-656-4414, mike.clancy@fnmoc.navy.mil

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives: N/A

FUNDING

Programmed/Planned (\$'s/FY): FY05/\$5.2M FY06/\$5.3M FY07/\$5.4M

TYPE OF PROGRAM/APPLICATION

Product Development/Improvement

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: A new gravity-wave drag formulation and an improved representation of terrain were implemented in the Navy Operational Global Atmospheric Prediction System (NOGAPS) model. The Navy Atmospheric Variational Data Assimilation System (NAVDAS), which accomplishes 3D-VAR data assimilation for NOGAPS, was upgraded to assimilate satellite radiance data. Work is progressing to assimilate additional upper-air and surface wind observations from satellite sensors into NOGAPS, and to upgrade the horizontal and vertical resolution of NOGAPS.
- *How operations will be changed/improved:* These new developments will improve the forecast skill of sensible weather, flight-level winds, and tropical cyclone tracks.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Implementation Plan for the Oceanographer of the Navy's R&D Strategy
- Program/Project verification process: Periodic work unit reviews by resource sponsors and Administrative Model Oversight Panel
- *Method used for end product validation:* Well-established statistical and event-based model verification procedures
- Operational training for the user: Recurring training for Navy METOC professionals

- *Next major program milestone:* Upgrade NOGAPS from ~55 km horizontal resolution and 36 levels in the vertical to ~30 km horizontal resolution with 48 levels in the vertical in FY06.
- **Program becomes operational:** Implementation of new gravity-wave drag formulation and improved terrain in NOGAPS took place in November of 2003. Addition of radiance assimilation to NAVDAS/NOGAPS occurred in June of 2004.
- Plans for further improvements: Assimilation of upper-air satellite wind observations from the MODIS sensor
 and surface satellite wind observations from the QuikSCAT sensor. Upgrade in horizontal and vertical
 resolution for NAVDAS and NOGAPS. Continual implementation of incremental upgrades to NAVDAS and
 NOGAPS.

Electrical Storm Identification Device (ESID)

PROGRAM/PROJECT: Electrical Storm Identification Device (ESID)

LEAD AGENCY: United States Navy (USN - Commander, Naval Meteorology and Oceanography Command (CNMOC))

<u>LEAD AGENCY POINT OF CONTACT</u>: Mr. John Meyer, N6, 228-688-5228, meyerj@cnmoc.navy.mil <u>PROGRAM POINT OF CONTACT</u>: Mr. Charleston Simms, 228-688-4485, simmsc@navo.navy.mil; Mr. Leo Garner, 228-688-4396, garnerl@navo.navy.mil

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives: N/A

FUNDING

Programmed/Planned (\$'s/FY): FY05/\$8K FY06/\$8K FY07/\$0K (Replaced by NITES-III mid FY07)

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: Standalone, deployable hardware system that detects lighting strikes (cloud to cloud/cloud to ground) within an adjustable radius.
- How operations will be changed/improved: ESIDS allows lighting strike data to be gathered at remote locations.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Sponsor (CNMOC) approved Project Management Plan.
- Program/Project verification process: Requirements Trace matrix validation and verification by ISEA (NAVO) with concurrence from both the Sponsor (CNMOC) and end users at the selected Operational field-testing facilities/sites.
- Method used for end product validation: End product validation was accomplished via requirements validation, and integration testing conducted at selected operational sites.
- *Operational training for the user:* Operational training for all end users and operational sites was conducted during initial system deployment. Additional training materials can be found in the ESID user's guide.

- Next major program milestone: Program is in the lifecycle management phase, no additional milestones exist.
- **Program becomes operational:** ESIDS is currently an operational system.
- *Plans for further improvements:* NO further improvements are planned; program is strictly a lifecycle management program. Lifecycle management will continue until functionality can be assumed by future system, NITES III in the mid FY07.

Lightning Position and Tracking System (LPATS)

PROGRAM/PROJECT: Lightning Position and Tracking System (LPATS)

LEAD AGENCY: United States Navy (USN - Commander, Naval Meteorology and Oceanography Command (CNMOC))

<u>LEAD AGENCY POINT OF CONTACT</u>: Mr. John Meyer, N6, 228-688-5228, meyerj@cnmoc.navy.mil <u>PROGRAM POINT OF CONTACT</u>: Mr. Charleston Simms, 228-688-4485, simmsc@navo.navy.mil; Ms. Shelli Ladner, 228-688-4686, ladners@navo.navy.mil

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives: 2: 5.9

FUNDING

Programmed/Planned (\$'s/FY): FY05/\$194K FY06/\$203K FY07/\$105K (Replaced by NITES-III mid FY07.)

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: Commercially available system for lightning detection that can be
 deployed at remote locations.
- *How operations will be changed/improved:* Accurate location of lightning strikes is important for safe aviation ground operations during convective storms.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Sponsor (CNMOC) approved Project Management Plan.
- Program/Project verification process: Requirements Trace matrix validation and verification by ISEA (NAVO) with concurrence from both the Sponsor (CNMOC) and end users at the selected Operational field-testing facilities/sites.
- *Method used for end product validation:* End product validation was accomplished via requirements validation, and integration testing conducted at selected operational sites.
- *Operational training for the user:* Operational training for all end users and operational sites was conducted during initial system deployment. Additional training materials can be found in the LPATS user's guide.

- Next major program milestone: Program is in the lifecycle management phase, no additional milestones exist.
- Program becomes operational: LPATS is currently an operational commercial system.
- Plans for further improvements: NO further improvements are planned; program is strictly a lifecycle
 management program. Lifecycle management will continue until functionality can be assumed by future system,
 NITES III in mid FY07.

Meteorological Integrated Data Display System-Next (MIDDS-Next)

PROGRAM/PROJECT: Meteorological Integrated Data Display System-Next (Fac) (MIDDS-Next) **LEAD AGENCY:** United States Navy (USN - Commander, Naval Meteorology and Oceanography Command (CNMOC))

LEAD AGENCY POINT OF CONTACT: Mr. John Meyer, N6, 228-688-5228, meyerj@cnmoc.navy.mil **PROGRAM POINT OF CONTACT:** Mr. Charleston Simms, 228-688-4485, simmsc@navo.navy.mil; Mr. Jim Cranfield, 228-688-4819, cranfieldj@navo.navy.mil

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives: TBD

FUNDING

Programmed/Planned (\$'s/FY): FY05/\$687K FY06/\$537K FY07/\$268K

TYPE OF PROGRAM/APPLICATION

Product Development, Integration, Training, Life Cycle Engineering, and Maintenance

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: COTS environmental prediction software and hardware integrated in such a way as to provide for the automated collection, analysis, forecasting, display, and dissemination of weather products and services, primarily focused on the needs of Naval aviation facilities. MIDDS Next (Fac) is capable of multiple data feeds, including, but not limited to, NOAAPort, and METCAST. MIDDS Next (Fac) interfaces with the Non-secure Internet Protocol Network (NIPRNET), Internet, and local sensors such as the Automated Surface Observing System (ASOS). Data is displayed locally on large screen monitors to facilitate briefings and monitoring of weather related events.
- *How operations will be changed/improved:* MIDDS-NEXT implements a Net-Centric / Data Reach-Back architecture. This architecture allows the METOC community to realize numerous aviation efficiencies, and cost savings.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Sponsor (CNMOC) approved Project Management Plan.
- Program/Project verification process: Requirements Trace matrix validation and verification by ISEA (NAVO) with concurrence from both the Sponsor (CNMOC) and end users at the selected Operational field-testing facilities/sites.
- *Method used for end product validation:* End product validation is accomplished via requirements tracking and validation, development, integration, system testing, configuration management processes, documentation, baseline validation, and system and software life cycle support. NAVO N64 follows Industry Software Engineering processes and practices in accordance with their Capability Maturity Model Level 3 Certification.
- Operational training for the user: Operational training for all end users and system administrators at
 operational sites was conducted during initial system deployment. Training materials, LEADS User's Guides,
 LEADS System Checklists and Administrator Guides were provided during initial system deployment. Refresher
 training for MIDDS-Next end users, LEADS scripts writers, and System Administrators is conducted at sixmonth intervals.

- Next major program milestone: Program is in installation / training phase. With several Navy and USMC sites scheduled for installs in FY05. Once all sites have been installed MIDDS-Next will continue with refresher training, periodic upgrades based on end user requirements, and maintenance life-cycle support.
- *Program becomes operational:* MIDDS-Next is currently an operational system.
- Plans for further improvements:
 - Continue software upgrades based on fleet and shore end user requirements through mid FY07.

Icing Research Program (IRP)

PROGRAM/PROJECT:

LEAD AGENCY/COLLABORATING AGENCIES: U. S. Army Corps of Engineers (USACE) Engineer Research and Development Center (ERDC) Cold Regions Research and Engineering Laboratory (CRREL), National Aeronautics and Space Administration (NASA) Glenn Research Center, Federal Aviation Administration (FAA) Aviation Weather Research Program and the FAA Technical Center, National Center for Atmospheric Research (NCAR), and the National Oceanic and Atmospheric Administration (NOAA) Environmental Technology Laboratory.

<u>LEAD AGENCY POINT OF CONTACT</u>: Dave Johnson, DAMI POB, 703-695-2869, david.johnson@hqda.army.mil

PROGRAM POINT OF CONTACT: Dr. Charles C. Ryerson, CRREL, 603-646-4487, charles.c.ryerson@erdc.usace.army.mil

SERVICE AREA(S)/INITIATIVE(S)

National Aviation Weather Initiatives:
5: 11, 14, 15

FUNDING

Programmed/Planned (\$'s/FY):
 \$420K /FY05
 \$250K /FY06
 \$250K/FY07

TYPE OF PROGRAM/APPLICATION

R&D/Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: a capability to remotely detect icing conditions ahead of aircraft using radar and microwave radiometers from the air or from the ground, and development of methods to rapidly and safely de-ice Army helicopters during pre-flight preparations.
- How operations will be changed/improved: detection and avoidance of in-flight icing and improved methods of detecting and removing ice. This program is focused on improving the Army's capability for operating in icing conditions.

PROGRAM/PROJECT MANAGEMENT

- *Basic guidance document for this program:* Icing Research Program Development Plan internally developed at CRREL, and with NASA-Glenn Research Center and AFRL.
- *Program/Project verification process:* CRREL Technical Director, CRREL Management Information Office, ERDC, NASA, FAA, AFRL, AMCOM.
- Method used for end product validation: Field programs.
- Operational training for the user: Not applicable yet. Hands-on and text materials anticipated.

- Next major program milestone: N/A
- When program will become operational: Anticipate operational prototype in FY10.
- Plans for further improvements: Continued research and development to characterize operational
 meteorological conditions, development of icing condition retrieval algorithms, and development of simulation
 techniques for DOD applications.

Meteorological Measuring Set – Profiler (MMS-P)

PROGRAM/PROJECT:

LEAD AGENCY: United States Army (USA)

LEAD AGENCY POINT OF CONTACT: Dave Johnson, DAMI POB, 703-695-2869,

david.johnson@hqda.army.mil

PROGRAM POINTS OF CONTACT: MAJ William D. Fischer, SFAE-IEWS-NS-TIMS, 703-704-4228

William.D.Fischer@us.army.mil

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: 3: 5. 6

FUNDING

• Programmed/Planned (\$'s/FY): \$M 4.963/FY05 4.869/FY06 1.600/FY07

TYPE OF PROGRAM/APPLICATION

Acquisition

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: vehicle mounted system that provides current ("nowcast")
 meteorological data throughout a defined area. Data can be used for ballistic computation or applied to other
 decision aids for battlefield operations.
- How operations will be changed/improved: improved receipt and processing of weather information from Air Force communications satellites and local sensors, and dissemination of meteorological information for application to ballistic solutions. This system will provide timely and accurate meteorological effects on munitions and firing solutions to Command and Control (C2) systems.

PROGRAM/PROJECT MANAGEMENT

- *Basic guidance document for this program:* Interim DOD 5000.1/5000.2; Operational Requirements Document (ORD) Approved 15 Oct 99. Milestones I/II Approval 12 Apr 00.
- *Program/Project verification process:* Preliminary Design Review (PDR); Critical Design Review (CDR); Functional and Physical Configuration Audits.
- *Method used for product validation:* Developmental, Functional Validation, Acceptance, Operational, and Regression Testing.
- *Operational training for the user:* two weeks of operator training as part of the fielding. Sustainment training available through Computer Based Training (CBT) package fielded with the system. Institutional training provided by the US Army Field Artillery Center, Fort Sill. Complete operators course will be 11 weeks long; maintainers course will be 13 weeks long.

- *Next major program milestone:* Full Rate Production (FRP) (February 2005).
- *Program becomes operational:* The Profiler is scheduled for First Unit Equipped in the second quarter of fiscal year 2005 (2Q FY05). (Accelerated fielding potential 1Q FY05).
- *Plans for further product improvements:* Enhance capability to receive/process high-resolution weather satellite imagery; ability to respond to data requests while on the move; expand model capability to 500km x 500km area.

Integrated Meteorological System (IMETS)

PROGRAM/PROJECT:

LEAD AGENCY: United States Army (USA)

LEAD AGENCY POINT OF CONTACT: Dave Johnson, DAMI POB, 703-695-2869,

david.johnson@hqda.army.mil

PROGRAM POINT OF CONTACT: Bob Dickenscheid, SFAE-C3S-MET, (505) 678-1984, DSN 258-1984, rdickens@arl.army.mil

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives:

1: 9 **2:** 8 **5:** 7 **6:** 5 **7:** 6

FUNDING

• *Programmed/Planned (\$'s/FY):* \$6.1M/FY05 \$6.2M/FY06 \$6.2M/FY07

TYPE OF PROGRAM/APPLICATION

Acquisition

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: a system to produce, display, and disseminate tailored mission weather forecasts, warnings, and decision aids for battlefield operations. There are three system configurations: vehicle-mounted, command post, and light configuration.
- **How operations will be changed/improved:** improved receipt and processing of weather information from a variety of sources and dissemination of weather/environmental information in graphical format to command systems to aid decision making. This system will provide timely and accurate weather and environmental effects on missions and weapon systems displayed on a Common Tactical Picture/Common Operational Picture (CTP/COP).

PROGRAM/PROJECT MANAGEMENT

- Basic Guidance Document for the program: As an Army Acquisition Project, guidance is provided in the DOD 5000.1/5000.2. Several documents provide guidance for project execution. These documents include the following: Modified Integrated Program Summary, Acquisition Strategy, Acquisition Program Baseline, Test and Evaluation Master Plan, Operational Requirements Document, Integrated Logistics Support Plan, System Threat Assessment, and associated Safety/Environmental assessments,
- *Project verification process:* There are at least four milestone reviews. Additional reviews/audits include the following: Preliminary Design Review, Critical Design Review, Functional and Physical Configuration Audits
- *Method used for end product validation:* Developmental, Functional Validation, Acceptance, and Operational and Regression Testing
- Operational training for the user: Three weeks of operator training and 1 week of maintainer training as part
 of the fielding. Recurring training is provided by the Weather Squadrons attached to the units to which IMETS
 has been fielded supplemented by the Air Force Combat Weather Center which conducts Just-In-Time training
 as needed. At USAIC at Ft. Huachuca, AZ instruction modules on IMETS are taught to AF Staff Weather
 Officers who are being assigned to Army units. These modules also support MI Officers during formal field
 exercises.

- *Next major program milestone:* Milestone C IPR (December 04)
- **Program will become operational:** The IMETS Vehicle Mounted Configuration (VMC) is fielded and the Light Configuration (LC) IMETS has been fielded to selected high priority units. The Command Post Configuration (CPC) will be fielded beginning in 2005.
- *Plans for further improvements*: Integrate common AF/Army developed Joint Environmental Toolkit (JET) software package into IMETS.
- Plan to support development and integration of IMETS weather modules that directly support DCGS-A ORD requirements such as the exploitation of the Weather Running Estimate (WRE) local weather data in the UA to provide inputs to IPB, EO/IR sensors, ISR sensor Control, and mission planning, COP on DCGS-A. Enhance capability to receive/process high-resolution weather satellite imagery.

<u>Appendix A-5</u> <u>Industry/University/Association</u>

IND-1	TPMS	Turbulence Plot Message System
IND-1 IND-2	ADWA	Automated Delivery of Wind Shear Alerts
IND-3	FDI	Forecasting for De-Icing
IND-4	ATLAS	Aircraft Total Lightning Advisory System
IND-5	WINN	Weather Information Network
IND-6	WHI-DL	Radio-On-A-Chip
IND-7	WHI-VHF	Weather Hazard Information for General Aviation (2-way VHF)
IND-8	RO	Route Optimization
IND-9	S-DARS	Satellite Digital Audio Radio System
IND-10	AWARE	Advanced Weather Awareness and Reporting Enhancements
IND-11	EWxR	Enhanced Weather Radar
IND-12	LIDAR	Light Detection and Ranging
IND-13	SWIS	Satellite Weather Information System
IND-14	WITC	Weather-In-The Cockpit
IND-15	DA	Divert Alerts
IND-16	GLDI	Global Lightning Data Integration
IND-17	APWE	Aviation Pilot Weather Education
UNIV-1	AWHCS	Aviation Weather Hazard Characterization System
UNIV-2	ASC	Aerospace Short Courses
UNIV-3	COMET	Cooperative Program for Operational Meteorology, Education and
		Training
ASSOC-1	NWA	National Weather Association

Turbulence Plot Message System (TPMS)

PROGRAM/PROJECT:

LEAD AGENCY/COLLABORATING AGENCIES: Northwest Airlines (NWA) and ARINC

LEAD AGENCY POINT OF CONTACT: Tom Fahey, Manager Meteorology, Northwest Airlines, 612-726-3256, tom.fahey@nwa.com

PROGRAM POINT OF CONTACT: Teresa Anderson, Sr. Program Manager, ARINC, 410-266-4202, TAA@arinc.com

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives:

2: 2 **3:** 3 **5:** 2 **6:** 2 **7:** 3 **8:** 2

FUNDING

Programmed/Planned (\$'s/FY): /FY03 /FY04

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: automatic, en-route, text-formatted messages containing aviation weather hazard forecasts, reports, and avoidance procedures. Eight hazards are included in the system: Clear Air Turbulence, Mountain Wave induced Turbulence, Thunderstorm Activity, Low Altitude Frontal Wind Shear, Low Altitude Convective Wind Shear, Volcanic Ash, Icing and Ozone. NWA pilots receive the information in text format via ARINC's Aircraft Communications, Addressing and Reporting System (ACARS). ARINC has developed a system to display the Text Plotted Messages (TPM) graphically and is making it available to airlines via a redistribution agreement with NWA.
- How operations will be changed/improved: provides automatic information of en route turbulence and other atmospheric weather hazards to pilots en route, and other end users, to aid in safe and efficient routing.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: The "Turbulence Plot Handbook".
- Program/Project verification process: N/A
- Method used for end product validation: N/A
- Operational training for the user: eight class hours for new hire pilots; forty hour class for upgrading dispatchers; and Enhanced Weather Information System (EWINS) approved training for all NWA meteorologists as documented in EWINS Training Manual.

- *Next major program milestone:* Integration of TPM and Weather Depiction Charts (Upper Air and Surface) into one package available for distribution.
- **Program becomes operational:** TPMS is currently operational.
- Plans for further improvements: Increased use of web based technology for distribution of graphical products.

Automated Delivery of Wind Shear Alerts (ADWA)

PROGRAM/PROJECT:

LEAD AGENCY/COLLABORATING AGENCIES: Northwest Airlines (NWA), Federal Aviation Administration (FAA)

LEAD AGENCY POINT OF CONTACT: Tom Fahey, Manager Meteorology, Northwest Airlines, 612-726-3256, tom.fahey@nwa.com

PROGRAM POINT OF CONTACT:

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: 6: 2

FUNDING

• Programmed/Planned (\$'s/FY): /FY03 /FY04

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: automated delivery of wind shear hazard information to the flight deck. Northwest Airlines uses the in house Turbulence Plot System (TPS) and the FAA's Terminal Weather Information for Pilots (TWIP) system to deliver alerts of low altitude wind shear hazards to the flight decks of NWA aircraft. Alerts for shears are produced using the Low Level Wind Shear Advisory System (LLWAS), the Terminal Doppler Weather Radar (TDWR), and manually by NWA meteorologists.
- How operations will be changed/improved: minimizes the effects of hazardous weather to aircraft on arrival and departure.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Part of the "Turbulence Plot Handbook".
- Program/Project verification process: N/A
- Method used for end product validation: N/A
- Operational training for the user: Part of an 8 hour class for new hire pilots; part of a 40 hour class for upgrading dispatchers; and part of the Enhanced Weather Information System (EWINS) approved training for all NWA meteorologists as documented in EWINS Training Manual.

- Next major program milestone: N/A
- *Program becomes operational:* Has been operational since 1995.
- Plans for further improvements: Improved accuracy of the automated wind shear alerts.

Forecasting for De-icing

PROGRAM/PROJECT:

LEAD AGENCY: Northwest Airlines (NWA)

LEAD AGENCY POINT OF CONTACT: Tom Fahey, Manager Meteorology, Northwest Airlines, 612-726-3256, tom.fahey@nwa.com

PROGRAM POINT OF CONTACT: Tom Fahey, Manager Meteorology, Northwest Airlines, 612-726-3256, tom.fahey@nwa.com

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: 4: 1.4.5.6

FUNDING

• Programmed/Planned (\$'s/FY): /FY03 /FY04

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: forecasts in 1 hour increments out to 16 hours for percent probability of rime on descent, snowfall, rates of accumulation, freezing precipitation, total accumulations out to 24 hours, existence of frost, wind direction and gusts over 16kts. Northwest Airlines, EWINS (Enhanced Weather Information System) Certified Aviation Meteorologists produce very detailed forecasts to support ground operations and operations control decision making. These forecasts are made 3 times a day for NWA's three main hub airports. During major winter storms, forecasts are made for 4 to 10 additional airports surrounding the major hubs and include most of the variables listed above as well as a graphical product depicting locations of light, moderate and heavy snowfall rates as well as freezing precipitation.
- How operations will be changed/improved: very detailed forecasts to support ground operations and operations control decision making. Reduces the impact of winter storms on airline operations.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: NWA Meteorology Procedures Manual.
- Program/Project verification process: N/A
- Method used for end product validation: N/A
- Operational training for the user: NWA Meteorology Procedures Manual and semi annual General Refresher classes.

- Next major program milestone: N/A
- **Program becomes operational:** Operational since 1993.
- *Plans for further improvements:* Increased use of web based technology for display and distribution of the products.

Aircraft Total Lightning Advisory System (ATLAS)

PROGRAM/PROJECT: Aircraft Total Lightning Advisory System

LEAD AGENCY/COLLABORATING AGENCIES: Airborne Research Associates

LEAD AGENCY POINT OF CONTACT:

PROGRAM POINT OF CONTACT: Ralph Markson, 781-899-1834, rmarkson@comcast.net

SERVICE AREA/INITIATIVE

• National Aviation Weather Initiatives: 2: 5. 9

FUNDING

Programmed/Planned (\$'s/FY): 400K/FY05 400K/FY06 /FY07

TYPE OF PROGRAM/APPLICATION

R&D

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: a single sensor total lightning [cloud-to-ground (CG) and intracloud (IC)] mapping system for use on aircraft and/or on the ground. In addition a system is being developed using an array of separated ground based sensors that will provide this information regionally and nationally.
- How operations will be changed/improved: detection of IC lightning typically provides 5 to 30 minutes advanced warning of air-mass thunderstorm development and associated convective hazards. The rate of IC flashes also provides a measure of convective intensity which is not available from less frequent CG flash data. Advanced warning of convective hazards associated with thunderstorms can potentially reduce accidents and increase efficiency of operations within the National Airspace System.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: (1) Final Report NASA/STTR Contract NAS1-20513, ATLAS: Aircraft Total Lightning Advisory System, August 1996; (2) Final Report NASA/STTR Contract NAS1-20594; LASI: Lightning and Storm Intensity Weather Warning System, April 1998; (3) Final Report, Atlas Validation Project, submitted to NASA/Langley Research Center, AWIN Program, December 1999; (4) US Patent No. 4,996,473 "Microburst/Windshear Warning System", 1991, (covers microburst prediction and quantification of storm intensity using lightning data acquired with any lightning mapping system).
- Program/Project verification process: A multi-station total lightning network will verify the single sensor.
- *Method used for end product validation:* Product validation for the current development of an aircraft system can be through comparison with data from the Kennedy Space Center's Lightning Detection and Ranging System (LDAR), the National Lightning Detection Network (NLDN), ARA's multi-sensor ground based array and NexRad maps.
- Operational training for the user: Training will be provided by Airborne Research Associates.

- *Next major program milestone*: First demonstration planned for 2005.
- *Program becomes operational:* Dependent on other companies for marketing and production.
- *Plans for further improvements:* Complete a new algorithm utilizing spectrographic analysis to better identify first pulses.

Weather Information Network (WINN)

PROGRAM/PROJECT:

LEAD AGENCY/COLLABORATING AGENCIES: Honeywell

LEAD AGENCY POINT OF CONTACT: Dan Leger, Weather Services Manger, Honeywell, 602-436-6512,

daniel.r.leger@honeywell.com

PROGRAM POINT OF CONTACT: Dan Leger, Weather Services Manger, Honeywell, 602-436-6512,

daniel.r.leger@honeywell.com

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives:

1:6 2:3 3:4 5:3 6:3 7:4 8:4

FUNDING

• Programmed/Planned (\$'s/FY): /FY03 /FY04

TYPE OF PROGRAM/APPLICATION

Commercial

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: a cockpit display and communications capability to deliver near realtime ground-based, graphical weather hazard and beneficial indications to the cockpit and Airline Operation Centers, anywhere in the world. This system is part of a total aircraft information infrastructure being developed and demonstrated by Honeywell for commercial airline application. WINN focuses on providing updated weather information and graphics to the airborne flight crew.
- How operations will be changed/improved: The commercial airline flight crew will have on-demand access to aviation weather information and updates, and automatic access to hazardous weather alerts as they are generated resulting in safer and more efficient operations.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: N/A
- Program/Project verification process: N/A
- Method used for end product validation: N/A
- *Operational training for the user:* Class room training.

- Next major program milestone: N/A
- Program becomes operational: WINN is being marketed commercially by Honeywell.
- Plans for further improvements: N/A

Radio-On-A-Chip Honeywell-NASA Cooperative Research Agreement (CRA)

PROGRAM/PROJECT: Weather Accident Prevention Project/Weather Information Communications **LEAD AGENCY/COLLABORATING AGENCIES:** National Aeronautics and Space Administration (NASA) **LEAD AGENCY POINT OF CONTACT:** Gus Martzaklis, GRC, 216-433-8966,

Konstantinos.S.Martzaklis@nasa.gov

PROGRAM POINT OF CONTACT: Michael Jarrell, GRC, 216-433-8102, michael.a.jarrell@nasa.gov

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives: 1: 6 2: 3 3: 4 5: 3 6: 3 7: 4 8: 4

FUNDING

Programmed/Planned (\$'s/FY): /FY03 /FY04

TYPE OF PROGRAM/APPLICATION

R&D

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: technologies and prototype to enable display of graphical weather information in general aviation aircraft via data link using handheld low cost VDL avionics.
- How will operations be changed/improved: new weather information technologies will provide a capability to display graphical, intuitive weather information in general aviation cockpits, leading to improved situational awareness and improved decision making by General Aviation pilots with respect to weather hazards, assisting in the reduction of aircraft accidents attributable to weather.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: WxAP Project Plan.
- *Program/Project verification process:* NASA sponsored annual Weather Accident Prevention reviews, Aviation Safety Program Executive Council reviews, and reviews/audits at the project/element level.
- Method used for end product validation: Combination of (a) system-level modeling and simulations, (b)
 laboratory-based experiments and (c) flight experiments via appropriate industry and/or NASA research aircraft.
 Many of these validation efforts are performed under cost-shared cooperative research agreements with industry partners.
- *Operational training for the user:* Training guidance for the use of new graphical weather information technologies will be developed in conjunction with the AvSP System Wide Accident Prevention (SWAP) project.

- Next major program milestone: N/A
- *Program becomes operational:* CRA will end in Jan'04.
- Plans for further improvements: N/A

Weather Hazard Information for General Aviation ARNAV-NASA Cooperative Research Agreement (CRA)

PROGRAM/PROJECT: Weather Accident Prevention Project/Weather Information Communications **LEAD AGENCY/COLLABORATING AGENCIES:** National Aeronautics and Space Administration (NASA), Federal Aviation Administration (FAA),

LEAD AGENCY POINT OF CONTACT: Gus Martzaklis, GRC, 216-433-8966,

Konstantinos.S.Martzaklis@nasa.gov

PROGRAM POINT OF CONTACT: Michael Jarrell, GRC, 216-433-8102, michael.a.jarrell@nasa.gov

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives: N/A

FUNDING

• Programmed/Planned (\$'s/FY): /FY03 /FY04

TYPE OF PROGRAM/APPLICATION

R&D

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: Phase I, which completed in Dec 2000 was to study the need for graphical weather information. Phase II, which completed in Dec 2002, concerned weather product development.
- How will operations be changed/improved: improved situational awareness and improved decision making by General Aviation pilots with respect to weather hazards, assisting in the reduction of aircraft accidents attributable to weather.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: WxAP Project Plan.
- *Program/Project verification process:* NASA sponsored annual Weather Accident Prevention reviews, Aviation Safety Program Executive Council reviews, and reviews/audits at the project/element level.
- *Method used for end product validation:* Combination of (a) system-level modeling and simulations, (b) laboratory-based experiments and (c) flight experiments via appropriate industry and/or NASA research aircraft. Many of these validation efforts are performed under cost-shared cooperative research agreements with industry partners.
- Operational training for the user: Training guidance for the use of new graphical weather information technologies will be developed in conjunction with the AvSP System Wide Accident Prevention (SWAP) project.

SCHEDULE/IMPLEMENTATION

• Next major program milestone: N/A

• **Program becomes operational:** Complete

• Plans for further improvements: N/A

Route Optimization Honeywell-NASA Cooperative Research Agreement (CRA)

PROGRAM/PROJECT: Weather Accident Prevention Project

LEAD AGENCY/COLLABORATING AGENCIES: Honeywell, National Aeronautics and Space Administration (NASA)

LEAD AGENCY POINT OF CONTACT: Gus Martzaklis, GRC, 216-433-8966,

Konstantinos.S.Martzaklis@nasa.gov

PROGRAM POINT OF CONTACT: Paul Stough, LaRC, 757-864-3860, h.p.stough@larc.nasa.gov

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives: None

FUNDING

• Programmed/Planned (\$'s/FY): /FY03 /FY04

TYPE OF PROGRAM/APPLICATION

R&D

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: a decision support tool using new 3-dimensional algorithm and usercentered interface to enable dispatchers to consider weather information when developing routes. Honeywell will develop and demonstrate a weather decision support tool for use by dispatchers when developing routes.
- How will operations be changed/improved: new decision support tools will provide dispatchers with 3-D graphical weather information, improving the ability to route aircraft around weather hazards and assisting in the reduction of aircraft accidents attributable to weather.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: WxAP Project Plan.
- *Program/Project verification process:* NASA sponsored annual Weather Accident Prevention reviews, Aviation Safety Program Executive Council reviews, and reviews/audits at the project/element level.
- Method used for end product validation: Combination of (a) system-level modeling and simulations, (b)
 laboratory-based experiments and (c) flight experiments via appropriate industry and/or NASA research aircraft.
 Many of these validation efforts are performed under cost-shared cooperative research agreements with industry partners.
- Operational training for the user: Training guidance for the use of new graphical weather information technologies will be developed in conjunction with the AvSP System Wide Accident Prevention (SWAP) project.

- Next major program milestone: N/A
- Program becomes operational: N/A
- *Plans for further improvements:* Addition of terminal area weather to dispatcher decision support tool and improved graphical user interface.

Satellite Digital Audio Radio Service (S-DARS) Phase I & II Demonstration Rockwell Collins-NASA Cooperative Research Agreement (CRA)

PROGRAM.PROJECT: Weather Accident Prevention Project/Weather Information Communications **LEAD AGENCY/COLLABORATING AGENCIES:** Rockwell Collins, National Aeronautics and Space Administration (NASA)

LEAD AGENCY POINT OF CONTACT: Gus Martzaklis, GRC, 216-433-8966,

Konstantinos.S.Martzaklis@nasa.gov

PROGRAM POINT OF CONTACT: Michael Jarrell, GRC, 216-433-8102, michael.a.jarrell@nasa.gov

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiatives: 1: 2 2: 2 3: 3 5: 2 6: 2 7: 3 8: 3

FUNDING

• Programmed/Planned (\$'s/FY): /FY03 /FY04

TYPE OF PROGRAM/APPLICATION

Proof of Concept.

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: demonstrate the use of satellite digital audio radio to provide low cost, high bandwidth communications to airborne commercial airliners. A number of applications are being demonstrated on American Airlines flights over the North Pacific. Delivery of high-resolution weather graphics to the flight deck is one application. NCAR-RAP provides gridded weather hazard data to the S-DARS network (convection, in-flight icing, turbulence; oceanic hazards) via an S-DARS server.
- *How operations will be changed/improved:* Near real-time oceanic weather hazard update capability for the airborne flight crew; on-demand and automatic updates for CONUS weather hazard information and alerts.

PROGRAM/PROJECT MANAGEMENT

- *Basic guidance document for this program:* Rockwell Collins/NASA cooperative agreement; NASA/NCAR cooperative agreement.
- *Program/Project verification process:* Program reviews, monthly reporting, phase final reports.
- Method used for end product validation: In-service evaluations (ISE) on revenue passenger flights.
- *Operational training for the user:* Hands-on and textual materials.

- Next major program milestone: N/A
- When program will become operational: N/A- Proof of concept complete.
- Plans for further improvements: N/A

Advanced Weather Awareness and Reporting Enhancements (AWARE) Rockwell-NASA Cooperative Research Agreement (CRA)

PROGRAM/PROJECT: Weather Accident Prevention Project

LEAD AGENCY/COLLABORATING AGENCIES: Rockwell, National Aeronautics and Space Administration (NASA)

LEAD AGENCY POINT OF CONTACT: Gus Martzaklis, GRC, 216-433-8966,

Konstantinos.S.Martzaklis@nasa.gov

PROGRAM POINT OF CONTACT: Paul Stough, LaRC, 757-864-3860, h.p.stough@larc.nasa.gov

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives: N/A

FUNDING

• Programmed/Planned (\$'s/FY): /FY03 /FY04

TYPE OF PROGRAM/APPLICATION

R&D/Prototype Demonstration

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: technologies and prototype to enable display and briefing of flight plan relevant graphical and text-based weather information, and decision support tools to advise pilot of probability of mission success based on pilot preferences, risk tolerance, and aircraft equipage (advisory only).
- How will operations be changed/improved: improvements in pre-flight weather briefings, particularly for General Aviation pilots, consisting of flight plan relevant information and decision support aids, will lead to improved pilot situational awareness. These technologies will assist in the reduction of aircraft accidents attributable to weather.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: WxAP Project Plan.
- *Program/Project verification process:* NASA sponsored annual Weather Accident Prevention reviews, Aviation Safety Program Executive Council reviews, and reviews/audits at the project/element level.
- Method used for end product validation: Combination of (a) system-level modeling and simulations, (b)
 laboratory-based experiments and (c) flight experiments via appropriate industry and/or NASA research aircraft.
 Many of these validation efforts are performed under cost-shared cooperative research agreements with industry.
- *Operational training for the user:* Training guidance for the use of new graphical weather pre-flight briefings will be developed in conjunction with the AvSP System Wide Accident Prevention (SWAP) project.

- Next major program milestone: N/A
- *Program becomes operational:* The AWARE CRA has been completed and the technology is being integrated into NASA's Airborne Hazard Awareness System (AHAS).
- Plans for further improvements: N/A

Enhanced Weather Radar (EWxR) Rockwell-NASA Cooperative Research Agreement (CRA)

PROGRAM/PROJECT: Weather Accident Prevention Project

LEAD AGENCY/COLLABORATING AGENCIES: National Aeronautics and Space Administration (NASA)

LEAD AGENCY POINT OF CONTACT: Gus Martzaklis, GRC, 216-433-8966,

Konstantinos.S.Martzaklis@nasa.gov

PROGRAM POINT OF CONTACT: Paul Stough, LaRC, 757-864-3860, h.p.stough@larc.nasa.gov

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives: N/A

FUNDING

• Programmed/Planned (\$'s/FY): /FY03 /FY04

TYPE OF PROGRAM/APPLICATION

R&D/Prototype Demonstration

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: technologies and prototype to enable display of combined unlinked
 and on-board sensed graphical weather radar information in transport cockpits. Rockwell-Collins will
 develop and demonstrate a system for processing unlinked weather information from ground sources and
 combining this information with that from on-board weather radar sensors for display on a graphical weather
 display in the cockpit.
- How will operations be changed/improved: combined data from diverse weather sources will provide a complete weather picture including information sensed in the near-vicinity of the aircraft and forecast data, leading to improved pilot situational awareness and allowing collaborative decision making between pilots, ATC, and AOC. These technologies will assist in the reduction of aircraft accidents attributable to weather.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: WxAP Project Plan.
- *Program/Project verification process:* NASA sponsored annual Weather Accident Prevention reviews, Aviation Safety Program Executive Council reviews, and reviews/audits at the project/element level.
- Method used for end product validation: Combination of (a) system-level modeling and simulations, (b)
 laboratory-based experiments and (c) flight experiments via appropriate industry and/or NASA research aircraft.
 Many of these validation efforts are performed under cost-shared cooperative research agreements with industry partners.
- *Operational training for the user:* Training guidance for the use of new graphical weather information technologies combining forecast and nowcast or in-situ data will be developed in conjunction with the AvSP System Wide Accident Prevention (SWAP) project.

- Next major program milestone: N/A
- *Program becomes operational:* The EWxR CRA has been completed and the technology is being integrated into NASA's Airborne Hazard Awareness System (AHAS).
- Plans for further improvements: N/A

LIDAR Forward-Looking Turbulence Detection System (LIDAR) Coherent Technologies (CTI)-NASA Cooperative Research Agreement (CRA)

PROGRAM/PROJECT: Weather Accident Prevention Project

LEAD AGENCY/COLLABORATING AGENCIES: Coherent Technologies Inc. (CTI), National Aeronautics and Space Administration (NASA)

LEAD AGENCY POINT OF CONTACT: Gus Martzaklis, GRC, 216-433-8966,

Konstantinos.S.Martzaklis@nasa.gov

PROGRAM POINT OF CONTACT: Jim Watson, LaRC, 757-864-6985, James.f.watson@nasa.gov, Rod Bogue, DFRC, 661-276-3193, rod.bogue@nasa.gov

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives:

FUNDING

• Programmed/Planned (\$'s/FY): /FY03 /FY04

TYPE OF PROGRAM/APPLICATION

R&D/Prototype Demonstration

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: LIDAR technologies to enable detection of clear air turbulence with an airborne sensor system.
- How will operations be changed/improved: airborne detection of clear air turbulence will enable mitigation procedures to be performed to reduce the probability of injuries caused by encounter with a turbulence event.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: WxAP Project Plan.
- Program/Project verification process: NASA sponsored annual Weather Accident Prevention reviews, Aviation Safety Program Executive Council reviews, and reviews/audits at the project/element level.
- Method used for end product validation: Combination of (a) system-level modeling and simulations, (b)
 laboratory-based experiments and (c) flight experiments via appropriate industry and/or NASA research aircraft.
 Many of these validation efforts are performed under cost-shared cooperative research agreements with industry partners.
- *Operational training for the user:* Training guidance for the use of turbulence warning information will be developed in conjunction with the AvSP System Wide Accident Prevention (SWAP) project.

- Next major program milestone: N/A
- Program becomes operational: WxAP develops enabling technologies that need to be implemented by industry
 or other government agencies. Working cooperatively with industry through CRA's will enable quicker
 implementation and technology transfer to meet the project safety goal.
- *Plans for further improvements:* Forward-looking turbulence detection systems combining both Radar and LIDAR sensing technologies will be developed and demonstrated in a flight environment.

Satellite Weather Information System (SWIS) Rockwell-NASA Cooperative Research Agreement (CRA)

PROGRAM/PROJECT: Weather Accident Prevention Project/Weather Information Communications **LEAD AGENCY/COLLABORATING AGENCIES:** National Aeronautics and Space Administration (NASA) **LEAD AGENCY POINT OF CONTACT:** Gus Martzaklis, GRC, 216-433-8966, Konstantinos.S.Martzaklis@nasa.gov

PROGRAM POINT OF CONTACT: Michael Jarrell, GRC, 216-433-8102, michael.a.jarrell@nasa.gov

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives: N/A- See IND-10

FUNDING

• Programmed/Planned (\$'s/FY): /FY03 /FY04

TYPE OF PROGRAM/APPLICATION

R&D/Prototype Demonstration

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: technologies to enable dissemination of graphical weather information to the cockpit using satellite communication data link. Rockwell Collins and other industry partners developed and demonstrated a cockpit weather information system for the display of graphical weather information disseminated via satellite data link technologies.
- How will operations be changed/improved: the use of satellite data link for dissemination of graphical weather information will enable the use of advanced cockpit weather information systems any where in the world. These technologies will assist in the reduction of aircraft accidents attributable to weather.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: WxAP Project Plan.
- *Program/Project verification process:* NASA sponsored annual Weather Accident Prevention reviews, Aviation Safety Program Executive Council reviews, and reviews/audits at the project/element level.
- *Method used for end product validation:* Combination of (a) system-level modeling and simulations, (b) laboratory-based experiments and (c) flight experiments via appropriate industry and/or NASA research aircraft. Many of these validation efforts are performed under cost-shared cooperative research agreements with industry partners.
- Operational training for the user: Training guidance for the use of new graphical weather information technologies will be developed in conjunction with the AvSP System Wide Accident Prevention (SWAP) project.

- Next major program milestone: N/A
- *Program becomes operational:* WxAP develops enabling technologies that need to be implemented by industry or other government agencies. Working cooperatively with industry through CRA's will enable quicker implementation and technology transfer to meet the project safety goal.
- *Plans for further improvements:* Aviation weather information technologies using satellite data link technologies will be further developed and demonstrated for General Aviation as well as transport aircraft.

Weather-In-The-Cockpit (WITC) Sonalysts-NASA Cooperative Research Agreement (CRA)

PROGRAM/PROJECT:

LEAD AGENCY/COLLABORATING AGENCIES: Sonalysts, Inc., National Aeronautics and Space Administration (NASA)

LEAD AGENCY POINT OF CONTACT: Rip Coleman, Vice President, Aviation and Weather Analysis Systems, Sonalysts, Inc., 860-442-4355, coleman@sonalysts.com

PROGRAM POINT OF CONTACT: Same as above.

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives:
None

FUNDING

• Programmed/Planned (\$'s/FY): /FY03 /FY04

TYPE OF PROGRAM/APPLICATION

R&D/ Prototype Demonstration

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: a means of collecting and integrating multi-source, geo-referenced data from around the world and delivering timely decision support assistance directly to the cockpits of international air carriers.
- How operations will be changed/improved: improved weather information in the cockpit will enhance flight operations.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: N/A
- **Program/Project verification process:** Internal, Sonalysts, Inc. Full program/project verification process includes initial requirements and design specification, coding, test case/plan development, integration testing, and user-conducted alpha/beta testing prior to release. For new products there is also provision for conducting numerous case studies to ensure the accuracy of new data as it is integrated with a virtually unlimited set of worldwide, geo-referenced data sources. Every aspect of software development at Sonalysts, Inc. is conducted under strict configuration management and all code is extensively documented.
- *Method used for end product validation:* As described above, Sonalysts, Inc. software engineering process includes extensive validation testing before implementation.
- *Operational training for the user:* Sonalysts, Inc. provides initial and recurring classroom and hands on training for the wXstation suite of products.

- Next major program milestone: N/A
- When program will become operational: Currently available.
- Plans for further improvements: N/A

Divert Alerts (DA)

PROGRAM/PROJECT:

LEAD AGENCY/COLLABORATING AGENCIES: Sonalysts, Inc.

LEAD AGENCY POINT OF CONTACT: Rip Coleman, Vice President, Aviation and Weather Analysis Systems, Sonalysts, Inc., 860-442-4355, coleman@sonalysts.com

PROGRAM POINT OF CONTACT: Same as above.

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives: None

FUNDING

• Programmed/Planned (\$'s/FY): /FY03 /FY04

TYPE OF PROGRAM/APPLICATION

R&D/Prototype Demonstration

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: a means of quickly determining when an aircraft has been diverted and displaying that aircraft in such a way as to increase situational awareness for the flight dispatcher.
- How operations will be changed/improved: diverted aircraft can now be quickly identified and directed to airports with good landing weather which have adequate maintenance facilities and gate space.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Jointly developed Sonalysts, Inc. and United Airlines.
- **Program/Project verification process:** Internal, Sonalysts, Inc. Full program/project verification process includes initial requirements and design specification, coding, test case/plan development, integration testing, and user-conducted alpha/beta testing prior to release. For new products there is also provision for conducting numerous case studies to ensure the accuracy of new data as it is integrated with a virtually unlimited set of worldwide, geo-referenced data sources. Every aspect of software development at Sonalysts, Inc. is conducted under strict configuration management and all code is extensively documented.
- *Method used for end product validation:* As described above, Sonalysts, Inc. software engineering process includes extensive validation testing before implementation.
- *Operational training for the user:* Sonalysts, Inc. provides initial and recurring classroom and hands on training for the wXstation suite of products, including FlightTraXTM.

- Next major program milestone: N/A
- When program will become operational: Currently available.
- Plans for further improvements: N/A

Global Lightning Data Integration (GLDI)

PROGRAM/PROJECT:

LEAD AGENCY/COLLABORATING AGENCIES: Sonalysts, Inc.

<u>LEAD AGENCY POINT OF CONTACT:</u> Rip Coleman, Vice President, Aviation and Weather Analysis Systems, Sonalysts, Inc., 860-442-4355, coleman@sonalysts.com

PROGRAM POINT OF CONTACT: Same as above.

SERVICE AREA (S)/INITIATIVE (S)

• National Aviation Weather Initiatives: 2: 9

FUNDING

• Programmed/Planned (\$'s/FY): /FY03 /FY04

TYPE OF PROGRAM/APPLICATION

R&D/Prototype Demonstration

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc: a means of collecting and integrating lightning data from around the world with all other international geo-referenced data sets.
- How operations will be changed/improved: determination of severity of convection over remote areas, e.g. Central Pacific Ocean, will be enhanced by fusing lightning data with existing data like satellite imagery. This will directly impact the accuracy of convection and turbulence advisories provided to international flight crews.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: N/A
- Program/Project verification process: Internal, Sonalysts, Inc. Full process includes initial requirements and
 design specification, coding, test case/plan development, integration testing, and user-conducted alpha/beta
 testing prior to release. For new products there is also provision for conducting numerous case studies to ensure
 the accuracy of new data as it is integrated with a virtually unlimited set of worldwide, geo-referenced data
 sources. Every aspect of software development at Sonalysts, Inc. is conducted under strict configuration
 management and all code is extensively documented.
- *Method used for end product validation:* As described above, Sonalysts, Inc. software engineering process includes extensive validation testing before implementation.
- *Operational training for the user:* Provided for all wXstation® products including StormTraX®. Initial and recurring classroom and hands on training.

SCHEDULE/IMPLEMENTATION

• Next major program milestone: N/A

• Program becomes operational: N/A

• Plans for further improvements: N/A

Aviation Pilot Weather Education (APWE)

PROGRAM/PROJECT:

LEAD AGENCY/COLLABORATING AGENCIES: Air Safety Foundation (ASF), Aircraft Owners and Pilots Association (AOPA)

<u>LEAD AGENCY POINT OF CONTACT</u>: Bruce Landsberg, Executive Director, Air Safety Foundation, 301-695-2000, bruce.landsberg@apoa.org

PROGRAM POINT OF CONTACT: same as above

SERVICE AREA(S)/INITIATIVE(S)

National Aviation Weather Initiatives:

1: 4 **5:** 5 **7:** 11

FUNDING

• Programmed/Planned (\$'s/FY): /FY03 /FY04

TYPE OF PROGRAM/APPLICATION

General Aviation Pilot Training

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: a series of training videos for general aviation pilots.
- How operations will be changed/improved: these videos are part of an ASF developed outreach program. The objective is to reach new private and instrument rated pilots who are unable to come to safety seminars.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: The Air Safety Foundation mission statement.
- Program/Project verification process: Internal ASF procedures.
- Method used for end product validation: User feedback and critiques.
- Operational training for the user: N/A

- Next major program milestone: N/A
- When program will become operational: APWE is an operational outreach activity.
- Plans for further improvements: N/A

Aviation Weather Hazard Characterization System (AWHCS)

PROGRAM/PROJECT:

LEAD AGENCY: Oklahoma University Center for Analysis and Prediction of Storms (CAPS)

LEAD AGENCY POINT OF CONTACT: Dr. Kelvin Droegemeier, Director, Center for Analysis and Prediction of storms, 405-325-0453, kkd@ou.edu

PROGRAM POINT OF CONTACT: Dr. Kelvin Droegemeier, Director, Center for Analysis and Prediction of storms, 405-325-0453, kkd@ou.edu

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiative: N/A

FUNDING

• Programmed/Planned (\$'s/FY): /FY03 /FY04

TYPE OF PROGRAM/APPLICATION

Product Development

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: a capability of assimilating observations from contiguous NEXRAD radars, along with data from other remote sensing platforms, to create a three-dimensional, gridded database of atmospheric variables to generate an analysis of aviation weather impact variables including icing, turbulence, and convection.
- How operations will be changed/improved: provides a very detailed depiction of weather parameters over a selected region and can be implemented nationally. Data and products could be unlinked for use by pilots.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: Program plan developed by the Center for Analysis and Prediction of Storms with collaborators at the National Center for Atmospheric Research, MIT/Lincoln Laboratory, and the NOAA Forecast Systems Laboratory.
- Program/Project verification process: N/A
- Method used for end product validation: N/A
- *Operational training for the user:* Hands-on instruction with tutorials.

- Next major program milestone: N/A
- When program will become operational: Complete
- Plans for further improvements: N/A

Aerospace Short Courses (ASC)

PROGRAM/PROJECT: Continuing Education [www.kuce.org/aero]

LEAD AGENCY: University of Kansas **LEAD AGENCY POINT OF CONTACT:**

PROGRAM POINT OF CONTACT: Jean Rosenthal, 785-864-4758, jrosnthl@ku.edu

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiative:

5: 5

FUNDING

• Programmed/Planned (\$'s/FY): /FY03 /FY04

TYPE OF PROGRAM/APPLICATION

Training

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: courses on aircraft icing and aviation weather hazards that provides an understanding of the primary weather hazards faced by all aspects of aviation.
- How operations will be changed/improved: enable pilots to make preflight and in-flight weather-related decisions intelligently.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: The annual University of Kansas Aerospace Short Course schedule.
- Program/Project verification process: N/A
- Method used for end product validation: N/A
- Operational training for the user: Class room training.

- Next major program milestone: N/A
- When program will become operational: This is an operational program.
- Plans for further improvements: N/A

Cooperative Program for Operational Meteorology, Education, and Training (COMET)

PROGRAM/PROJECT: [http://www.comet.ucar.edu/]

LEAD AGENCY: National Center for Atmospheric Research (NCAR)

LEAD AGENCY POINT OF CONTACT:

PROGRAM POINT OF CONTACT: Dr. Joseph Lamos, (303) 497-8465, lamos@comet.ucar.edu

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiative: N/A

FUNDING

• Programmed/Planned (\$'s/FY): /FY03 /FY04

TYPE OF PROGRAM/APPLICATION

Training

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: training modules for providers of aviation weather information.
- How operations will be changed/improved: trained forecasters will make better forecasts resulting in safer and more efficient aviation operations.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: N/A
- Program/Project verification process: N/A
- Method used for end product validation: N/A
- Operational training for the user: N/A

- Next major program milestone: N/A
- *Program becomes operational:* This is an operational program.
- Plans for further improvements: N/A

National Weather Association (NWA)

PROGRAM/PROJECT: [http://www.nwas.org/committees/avn-wea.html]

LEAD AGENCY: National Weather Association (NWA) Aviation Weather Committee

LEAD AGENCY POINT OF CONTACT:

PROGRAM POINT OF CONTACT: Larry Burch, (801) 320-2569, larry.burch@noaa.gov

SERVICE AREA(S)/INITIATIVE(S)

• National Aviation Weather Initiative:

1: 4 **4:** 3 **5:** 5

FUNDING

• Programmed/Planned (\$'s/FY): /FY03 /FY04

TYPE OF PROGRAM/APPLICATION

Training

SCOPE OF PROGRAM/PROJECT

- What's being developed, procured, etc.: on-line training for pilots dealing with thunderstorms and winter weather flying.
- How operations will be changed/improved: better decision making by pilots resulting in safer and more efficient aviation operations.

PROGRAM/PROJECT MANAGEMENT

- Basic guidance document for this program: N/A
- Program/Project verification process: N/A
- Method used for end product validation: N/A
- Operational training for the user: N/A

- Next major program milestone: N/A
- *Program becomes operational:* Formal courses have been completed. Links are still available to take the courses informally on line.
- Plans for further improvements: N/A



Service Area (1): Ceiling and Visibility

	r. r.	FAA	NASA	NOAA	DOD	IND/UNIV
1	Develop and implement ceiling and visibility products that are applicable for use by ATC service providers, airline operations centers, and pilots. i i i i	FAA-4 FAA-35 FAA-36		NOAA-3 NOAA-12		
2	Develop and implement ground to air (Flight Information Service) capabilities to disseminate observations within 5 minutes of availability and ceiling and visibility analyses/ forecasts within 15 minutes of product generation to pilots, airline operations centers, and ATC service providers. i i i i	FAA-13 FAA-41	NASA-8			IND-6 IND-7 IND-9 IND-13
3	Increase the types and number of aircraft with the capability for automatic reporting of humidity and temperature. i i i	FAA-12 FAA-14				
4	Develop and implement training packages that focus on rapidly changing ceiling/visibility scenarios for tactical use by ATC service providers, airline operations centers, and pilots. i i i					IND-17
5	Improve the observing and reporting of widespread low ceiling and visibility affecting en route operations. i i i i	1		NOAA-3	DOD-1	
6	Develop and implement a color cockpit multifunctional display that includes ceiling and visibility along with terrain, and other traffic hazards. i i i		NASA-4			IND-5
7	Improve the resolution and accuracy of ceiling and visibility observations affecting terminal operations. i i i			NOAA-2	DOD-2 DOD-3 DOD-28	
8	Develop and implement forecasting (for up to one hour) and modeling techniques that will improve ceiling and visibility products, including resolution and accuracy in time and space, affecting terminal operations . i i i	FAA-15		NOAA-9		

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9		FAA-17			DOD-6	
	disseminate observations, pilot reports, analyses, and forecasts of	FAA-18			DOD-39	
	ceiling and visibility to pilots, airline operations centers, and ATC	FAA-19				
	service providers. i i					
10	Develop and implement forecast (for up to one hour) and			NOAA-9		
	modeling techniques that will improve ceiling and visibility					
	products, including resolution and accuracy in time and space,					
	affecting en route operations. i i					
11	Develop and implement forecasting (for one hour or greater) and	FAA-9		NOAA-9	DOD-33	
	modeling techniques that will improve ceiling/visibility products,	FAA-27				
	including resolution and accuracy in time and space, affecting					
	terminal operations. i i					
12	Implement the reporting, in compliance with ICAO requirements, of	FAA-34				
	runway visual range (RVR) at all U.S. airports having New					
	Generation RVR equipment. i i					
13	Develop and implement forecasting (for one hour or greater) and	FAA-27		NOAA-9	DOD-33	
	modeling techniques that will improve ceiling/visibility products,					
	including resolution and accuracy in time and space, affecting en					
	route operations. i					
14	Develop and implement capabilities for terminal operations in	FAA-41	NASA-8			
	zero-ceiling/zero-visibility meteorological conditions. i					

Ceiling and Visibility FAA NASA NOAA DOD IND/UNIV

Service Area (2): Convective Hazards

		FAA	NASA	NOAA	DOD	IND/UNIV
1	Develop and implement convective products covering phenomena	FAA-4		NOAA-12		
	such as hail, turbulence, tornadoes, lightning, and heavy	FAA-20		NOAA-17		
	precipitation, in a single display product which requires little or no	FAA-21				
	interpretation or analysis and is applicable for use by ATC service					
	providers, airline operations centers, and in the cockpit. i i i					
2	Develop and implement ground to air (Flight Information Service)	FAA-13	NASA-8			IND-1
	capabilities to readily disseminate convective storm observations	FAA-41				IND-6
	within 5 minutes of availability and forecast products within 15					IND-7
	minutes of product generation in order to facilitate convective					IND-9
	hazard avoidance. i i i i					IND-13
3	Develop and implement a multifunctional, color cockpit display		NASA-4			IND-5
	that includes convective storm attributes, such as hail, turbulence,					
	tornadoes, lightning, and heavy precipitation along with terrain					
	and other traffic hazards. i i i i					
4	Increase the types and number of aircraft capable of automatic	FAA-6				
	reporting of winds, temperatures, humidity, turbulence, and icing.	FAA-12				
	iiii	FAA-14				
5	Improve the resolution, accuracy, and the update rate of	FAA-1		NOAA-2	DOD-2	IND-4
	observations of hail, turbulence, tornadoes, lightning, and heavy	FAA-3		NOAA-4	DOD-3	
	precipitation associated with convective storms affecting terminal	FAA-38			DOD-4	
	operations.	FAA-39				
6	Establish a quantitative ICAO standard for characterizing hail,					
	turbulence, lightning, and heavy precipitation associated with					
	convective storms. i i i					

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	200.	•				
7	Develop and implement 0-1 hour forecast and modeling	FAA-10		NOAA-9		
	techniques that will improve hail, turbulence, tornado, lightning,	FAA-15				
	and heavy precipitation products, including resolution and					
	accuracy in time and space, associated with convective storms					
	affecting terminal operations. i i i					
8	Improve current ground-based communications systems to	FAA-17			DOD-6	
	readily disseminate convective storm observations, pilot reports	FAA-18			DOD-39	
	and forecast products to pilots, airline operations centers, and ATC	FAA-19				
	service providers. i i					
9	Improve the resolution, accuracy, and the update rate of		NASA-4F	NOAA-4	DOD-4	IND-4
	observations of hail, turbulence, tornadoes, lightning, and heavy					IND-16
	precipitation associated with convective storms affecting en route					
	operations. i					
10	Develop and implement 0-1 hour forecast and modeling	FAA-8		NOAA-9		
	techniques that will improve hail, turbulence, tornado, lightning,	FAA-22				
	and heavy precipitation products, including resolution and	FAA-44				
	accuracy in time and space, associated with convective storms					
	affecting en route operations. i i					
11	Develop and implement 1-hour and greater forecast and	FAA-8		NOAA-9	DOD-33	
	modeling techniques that will improve hail, turbulence, tornado,	FAA-27				
	lightning, and heavy precipitation products, including resolution					
	and accuracy in time and space, associated with convective storms					
	affecting en route operations. i					
12	Develop and implement 1-hour and greater forecast and	FAA-10		NOAA-9	DOD-33	
	modeling techniques that will improve hail, turbulence, tornado,	FAA-27				
	lightning, and heavy precipitation products, including resolution					
	and accuracy in time and space, associated with convective storms					
	affecting terminal operations. i					

Convective Hazards FAA NASA NOAA DOD IND/UNIV

Service Area (3): En Route Winds and Temperatures

		FAA	NASA	NOAA	DOD	IND/UNIV
1	Develop and implement en route wind and temperature products that are applicable for use by pilots, ATC service providers, airline operations centers, and others. i i i i	FAA-4				
2	Increase the types and number of aircraft with the capability for automatic reporting of winds and temperatures and ensure the widest dissemination possible to the National Weather Service and airline operations center's using established ground-based communication systems. i i i i	FAA-14	NASA-4A/G			
3	Develop and implement ground to air (Flight Information Service) capabilities to readily disseminate en route wind forecast products within 15 minutes of product generation for strategic route planning. i i i	FAA-13 FAA-41				IND-1 IND-6 IND-7 IND-9 IND-13
4	Develop and implement a multifunctional color cockpit display that includes en route wind and temperature information along with terrain and traffic hazards. i i i		NASA-4			IND-5
5	Expand the collection of data for winds and temperature aloft to include flight levels above FL390 and below 3,000 feet above ground level. i	FAA-14			DOD-38	
6	Improve the resolution and accuracy of wind and temperature aloft observations . i	FAA-14	NASA-4A/F/G NASA-5		DOD-38	
7	Develop and implement forecasting and modeling techniques that will improve en route wind and temperature products, including resolution and accuracy in space and time, affecting en route operations . i	FAA-23 FAA-44		NOAA-9	DOD-33	

Service Area (4): **Ground De-Icing and Anti-Icing**

	•	FAA	NASA	NOAA	DOD	IND/UNIV
1	Develop and implement ground de-icing decision aids that are applicable for use by, pilots, ATC service providers, airline operations centers, and airport managers. i i i	FAA-11				IND-3
2	Improve the detection and measurement of freezing/frozen precipitation, freezing fog, and frost to support ground de-icing, holdover, and airport operations. i i i			NOAA-2	DOD-2	
3	Develop and implement a training program on ground de-icing in order to increase air traffic controller, pilot and ground crew awareness. i i i					
4	Enhance capabilities to rapidly disseminate freezing/frozen precipitation, freezing fog, and frost forecasts to ATC service providers, airport managers and operators, and airline operations centers in order to improve ground de-icing operations. i i i	FAA-11				IND-3
5	Develop/improve 0-2 hour forecasts of freezing/frozen precipitation, freezing fog, and frost in order to plan ground deicing activities. i	FAA-11				IND-3
6	Develop/improve 2-6 hour forecasts of freezing/frozen precipitation, freezing fog, and frost in order to plan ground deicing activities. I					IND-3

Service Area (5): <u>In-Flight Icing</u>

	•	FAA	NASA	NOAA	DOD	IND/UNIV
1	Develop and implement icing products that are applicable for use by aircrews, ATC service providers, and airline operations centers for tactical and strategic icing avoidance. i i i i	FAA-4 FAA-5/5A		NOAA-1 NOAA-12		
2	Develop and implement ground to air (Flight Information Service) capabilities to readily disseminate icing observations, within five minutes of availability, and forecast products, within 15 minutes of product generation, throughout the National Airspace System, i.e., to the cockpit, to airline operations centers, and to ATC providers.	FAA-13 FAA-41	NASA-8			IND-1 IND-6 IND-7 IND-9 IND-13
3	Develop and implement a multifunctional, color cockpit display that includes icing along with terrain and traffic hazards. i i i		NASA-4			IND-5
4	Develop the capability and increase the types and number of aircraft with automatic reporting of icing related variables.	FAA-12 FAA-14	NASA-4A/G			
5	Develop training packages for use by operators of all types of aircraft to increase their knowledge of icing hazards and its impact on aircraft safety. i i i i		NASA-3			IND-17
6	Improve the vertical and horizontal resolution and accuracy of observations of icing related variables affecting en route operations . i i i	FAA-12 FAA-14 FAA-38	NASA-4A/G			
7	Improve current ground-based communications systems to readily disseminate icing products and reports within the National Airspace System, i.e., to the cockpit, to Airline Operations Centers, and to ATC service providers. i	FAA-17 FAA-18 FAA-19			DOD-6 DOD-39	
8	Develop and implement forecasting (for less than 1 hour) and modeling techniques that will improve icing guidance products for tactical avoidance. i	FAA-5A		NOAA-9		

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9	Establish and institutionalize an objective , quantitative standard for characterizing icing without regard to aircraft type. i					
10	Develop and implement forecasting (greater than one hour) and modeling techniques that will improve icing guidance products for strategic avoidance . i	FAA-5A		NOAA-9		
11	Incorporate new remote satellite-based and ground-based radar technologies to warn of impending ice encounters. i		NASA-2 NASA-4F		DOD-37	
12	Develop and implement icing-related training packages for ATC service providers and require the airlines to implement similar training packages for their pilots and operations center personnel.		NASA-3			
13	Develop and implement procedures that allow aircraft manufacturers to introduce new technologies , such as simulation-based design techniques, to streamline the aircraft certification process and improve understanding of aircraft performance in icing conditions. i		NASA-1			
14	Develop and incorporate new on-board ice accumulation detection and removal technologies. i				DOD-37	
15	Develop and incorporate new aircraft-mounted, forward-looking technologies that warn of impending icing encounters. i				DOD-37	

Service Area (6): <u>Terminal Wind and Temperature</u>

	•	FAA	NASA	NOAA	DOD	IND/UNIV
1	Develop and implement terminal wind and temperature products , such as microburst and low-level wind shear information integrated into a single display which requires little or no interpretation or analysis, that are applicable for use by pilots, ATC service providers, airline operations centers, and other users. i i i i	FAA-15		NOAA-8		
2	Develop and implement ground to air (Flight Information Service) capabilities to disseminate terminal wind hazard observations within 1-2 minutes of observation and forecast products within 15 minutes of product generation throughout the National Airspace System; i.e., to the cockpit, to airline operations centers, and to ATC service providers. i i i i	FAA-13 FAA-41	NASA-8			IND-1 IND-2 IND-6 IND-7 IND-9 IND-13
3	Develop and implement a multifunctional, color cockpit display that includes terminal wind hazards along with terrain and traffic hazards. i i i		NASA-4			IND-5
4	Increase the types and number of aircraft capable of automatic reporting of terminal wind hazards. i i i	FAA-14				
5	Improve current ground-based communications systems to readily disseminate hazardous and operationally significant wind condition reports and products affecting terminal operations. i i i	FAA-17 FAA-18 FAA-19			DOD-6 DOD-39	
6	Develop capabilities for providing terminal wind and temperature hazard information directly to decision support systems . i i	FAA-15 FAA-26		NOAA-2	DOD-2 DOD-3 DOD-8	

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7	Develop and implement aircraft-mounted, forward-looking technologies for detecting microburst, wind shear, and wake vortex events. i					
8	Expand the number of airports at which microburst and low-level wind shear services are available based on increased operations load and the emergence of more cost-effective technologies . i i	FAA-1 FAA-2 FAA-3				
9	Improve the forecasts of surface temperature, as well as associated procedures for the calculation of density altitude, for increased awareness of operational ramifications. i	FAA-27		NOAA-9		
10	Develop and implement forecasting (for 1 hour or greater) and modeling techniques that will improve hazardous and operationally significant surface wind condition products (including resolution and accuracy in time and space) affecting terminal operations . i	FAA-27		NOAA-9	DOD-33	
11	Develop and implement forecasting (for up to 1 hour) and modeling techniques that will improve hazardous and operationally significant surface wind condition products (including resolution and accuracy in time and space)affecting terminal operations . i	FAA-15		NOAA-9		
	Terminal Wind and Temperature	FAA	NASA	NOAA	DOD	IND/UNIV

Service Area (7): <u>Turbulence</u>

	-	FAA	NASA	NOAA	DOD	IND/UNIV
1	Expand the number and types of aircraft capable of automatic reporting of aircraft independent turbulence observations. i i i i	FAA-6	NASA-4A/G			
2	Develop and implement turbulence products that are applicable for use by pilots, ATC service providers, and airline operations centers for flight planning and decision making. i i i	FAA-4		NOAA-14		
3	Develop and implement ground to air (Flight Information Service) capabilities to readily disseminate turbulence observations within 5 minutes of availability, and forecast products, within 15 minutes of product generation, to aircraft for turbulence avoidance.	FAA-13 FAA-41	NASA-8			IND-2 IND-6 IND-7 IND-9 IND-13
4	Develop and implement a multifunctional, color cockpit display that includes turbulence along with terrain and traffic hazards. i i i i		NASA-4			IND-5
5	Establish and institutionalize an objective , quantitative standard for characterizing turbulence without regard to aircraft type.	FAA-6				
6	Improve current ground-based communications systems, including VHF, to readily disseminate turbulence warning products and reports for use by all aircraft. i i	FAA-17 FAA-18 FAA-19			DOD-6 DOD-39	
7	Investigate the utility of different procedures for improving passenger and aircrew safety in turbulent encounters. i					
8	Develop and implement forecasting (for less than 1 hour) and modeling techniques that will improve turbulence guidance products for tactical avoidance . i	FAA-44		NOAA-10		

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9	Develop and implement aircraft-mounted, forward-looking		NASA-9			IND-12
	technologies for detecting turbulence. i i					
10	Develop and implement forecasting (for 1 hour or greater) and	FAA-7		NOAA-9	DOD-21	
	modeling techniques that will improve turbulence guidance	FAA-23				
	products for strategic avoidance. i					
11	Require pilot training in acquiring knowledge about turbulence					IND-17
	hazards, their impact on aircraft, and suitable avoidance and					
	recovery techniques. i i					
12	Develop and implement remote (e.g., satellite-based) capabilities	FAA-33	NASA-4F			
	for detecting turbulence. i					
	Turbulence	FAA	NASA	NOAA	DOD	IND/UNIV

Service Area (8): Volcanic Ash and Other Airborne Hazardous Materials

		FAA	NASA	NOAA	USAF	IND/UNIV
1	Develop and implement analysis products for volcanic ash and other hazardous airborne materials that are applicable for use by ATC providers, airline operations centers, and pilots in flight planning, strategic decision-making, and tactical avoidance. i i i i	FAA-24 FAA-43		NOAA-6		
2	Develop and implement ground to air (Flight Information Service) capabilities to readily disseminate volcanic ash and other airborne hazardous material initial warning products within 30 minutes of occurrence and updates within 15 minutes of product generation.	FAA-13 FAA-41	NASA-8			IND-1 IND-6 IND-7 IND-9 IND-13
3	Improve current ground-based communications systems to readily disseminate volcanic ash and other airborne hazardous material initial warning products within 30 minutes of occurrence and updates within 15 minutes of product generation. i i	FAA-17 FAA-18 FAA-19				
4	Develop and implement a multifunctional, color cockpit display that includes volcanic ash clouds, hazardous airborne material clouds along with terrain, and traffic hazards. i i i		NASA-4			IND-5
5	Improve the resolution and accuracy in time and space of trajectory forecasts (up to 1 hour) of volcanic ash clouds and other airborne hazardous material in affected airspace for tactical avoidance. i	FAA-44		NOAA-15	DOD-14	
6	Improve the resolution and accuracy in time and space of trajectory forecasts (1 hour or greater) of volcanic ash clouds and other airborne hazardous material in affected airspace for strategic avoidance. i			NOAA-15	DOD-14	
7	Improve the detection of volcanic eruptions (e.g., using satellite-based techniques) as well as-the resolution and accuracy of observations of volcanic ash clouds and other airborne hazardous materials. i		NASA-4F	NOAA-7		

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8	Establish a quantitative ICAO standard for describing the composition of volcanic ash clouds and other airborne hazardous materials in terms of proportion of gas, acid content, particle sizes, and density. i					
9	Develop aircraft-mounted forward-looking technologies for detecting volcanic ash clouds. i					
Volcanic Ash		FAA	NASA	NOAA	DOD	IND/UNIV

Appendix C Aviation Weather Programs and Projects Historical Context

THE NATIONAL AVIATION WEATHER PROGRAM COUNCIL

In April 1997, the National Aviation Weather Program Council approved and published a *National Aviation Weather Program Strategic Plan*, which had been developed by the Council's Joint Action Group for Aviation Weather (OFCM 1997). The *Strategic Plan* was the first step in a federal agency response to the challenge for improved aviation weather safety set forth in a National Research Council report, *Aviation Weather Services—A Call for Federal Leadership and Action* (NRC 1995). The Federal Coordinator, who serves as Chair of the National Aviation Weather Program Council, has coordinated the federal response, as well as other activities to support and implement the *Strategic Plan*. These activities draw on the resources of the Joint Action Group for Aviation Weather and the Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM).

In the 1997 *Strategic Plan*, the National Aviation Weather Program Council took responsibility for overseeing periodic reviews of the program to provide mid-course corrections as needed, as well as to maintain momentum as the plan progressed. The OFCM was assigned a supporting role in providing analyses, summaries, and evaluations as "a factual basis for the executive and legislative branches to make appropriate decisions related to the allocation of funds" (OFCM 1997, pp. 3, 25).

The next major step toward coordinating the many federal and nonfederal programs relevant to improving aviation weather safety was another report prepared by the Joint Action Group for Aviation Weather, *National Aviation Weather Initiatives*. It was approved by the National Aviation Weather Program Council and released in February 1999. The *Initiatives* report identified ongoing and planned programs of the federal agencies, including federally funded academic research (OFCM 1999).

Early In 2001, the OFCM completed a comprehensive analysis of programs and projects that had been identified as meeting the needs and concerns compiled in the *National Aviation Weather Initiatives* report. Programs led by or involving participation of federal agencies, industry, universities, and associations were included. The results of this analysis were presented in the first release (April 2001) of the *National Aviation Weather Initiatives Final Baseline Tier 3/4 Report* (OFCM 2001). Since the baseline release, the Tier 3/4 report has become a living document, with ongoing additions of new programs and updates on the status of programs in progress. An update was issued in December 2003 (OFCM 2003a). This report constitutes another update in the series.

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¹ The *National Aviation Weather Program Strategic Plan* (OFCM 1997) constitutes Tier 1. The initiatives set forth in *National Aviation Weather Initiatives* (OFCM 1999) constitute Tier 2. Tiers 3 and 4 consist of the individual programs and projects identified as relevant to the aviation service areas and initiatives.

In a memorandum to the members of the Committee for Aviation Services and Research dated January 27, 2003, the Federal Coordinator asked the agencies to review and update the National Aviation Weather Initiatives as appropriate. The input from the agencies included no major changes to the initiatives as defined in the *Baseline Tier 3/4 Report*. There was general agreement that the current service areas sufficiently cover the weather hazards and that the Convection, In-Flight Icing, Ceiling & Visibility, Turbulence, and Terminal Winds service areas have the highest priority. The agencies made no changes to the relative (star) rankings. There were two new focus areas proposed: verification and base-lining national performance standards by the National Weather Service and stratospheric operations by the U.S. Air Force.

ACCIDENT REDUCTION GOALS FOR WEATHER-RELATED ACCIDENTS

In February 1997, the White House Commission on Aviation Safety and Security recommended a national goal for government and industry of reducing the rate of fatal aviation accidents by a factor of five (an 80 percent reduction) within 10 years. Safety research and technology improvements were recognized as essential elements in achieving this goal. Subsequently, both the Federal Aviation Administration (FAA) and the National Aeronautics and Space Administration (NASA) adopted the 80 percent reduction goal in their strategic plans.

The 1999 report by the Joint Action Group for Aviation Weather, *National Aviation Weather Initiatives*, included initiatives underway in the aviation industry and programs with industry, academic, and governmental partners. Furthermore, it adopted the 80 percent reduction goal and suggested that a reduction in weather-related accidents, as shown by National Transportation Safety Board (NTSB) accident statistics, could be used as an overall measure of success for the portfolio of aviation weather initiatives.

The NTSB uses categories for commercial air carriers and general aviation defined by three parts of the Federal Aviation Regulations (Title 14, U.S. Code of Federal Regulations):

- Part 91 covers all aviation other than military or commercial. In addition to privately owned and operated single and multiple engine propeller craft often thought of as general aviation, it includes private company jets, rotorcraft, gliders, balloons, experimental aircraft, aerial application flying (e.g., agricultural aviation), and instructional flying.
- Part 121 includes the major passenger airlines and cargo carriers that fly large transport-category aircraft in revenue service. In March 1997, the definition of Part 121 was changed to include all passenger aircraft operated in scheduled revenue service with 10 or more seats. Since 1997, therefore, most carriers that are popularly known as commuter airlines are included in Part 121.
- Part 135 includes scheduled passenger service in aircraft with fewer than 10 seats and nonscheduled operations. The nonscheduled operations refer to revenue-earning flights in which the departure time, departure location, and

arrival location are specifically negotiated with the customer or the customer's representative. All cargo flights that come under Part 135 are in the nonscheduled subcategory, as are air taxi services. Private carriage operations with a passenger-seat configuration of 20 seats or fewer and a payload capacity of 6,000 pounds or less come under the nonscheduled Part 135 operations, as do cargo operations in aircraft having a payload capacity of 7,500 pounds or less.

The NTSB reports annual data for Part 121 and the two categories (scheduled and nonscheduled) of Part 135 in the *Annual Review of Aircraft Accident Data for U.S. Air Carrier Operations*. The data for Part 91 are published as a separate series, the *Annual Review of Aircraft Accident Data for U.S. General Aviation*.

In August 2003, the OFCM released the *National Aviation Weather Program Mid-Course Assessment* (OFCM 2003b). The *Mid-Course Assessment* adopted the 80 percent reduction in accidents, from the level circa 1996, as a benchmark for assessing progress and seeking areas where more effort, or a redirection of effort, may be worthwhile. It adopted the analytical approach of "distributing the goal of an 80 percent reduction in fatal accidents across the three principal regulatory categories for aircraft and across categories for weather-related aviation hazards." In each category analyzed, an 80 percent reduction from the accident rate around 1996 was calculated as a target against which to assess progress in that category. As the report noted,

... the overall national goal can be met without achieving an 80 percent reduction in each category used for analysis. (It may even be preferable, for various reasons, to seek greater reductions in some areas than others.) Still, this common yardstick for "success" provides a convenient and useful starting point for assessing progress and considering mid-course corrective actions.

(OFCM 2003b, pp. 1-2)

The data analyses and graphs included in Appendix D of this report use the same approach as the *Mid-Course Assessment*. However, the final NTSB data for 2002 are now included in the tables and analyses. These updated analyses and comparisons with the trends established in the *Mid-Course Assessment* provide the basis for the discussion of *Weather Hazard Accident Trends* in the opening narrative of this update. To identify accident trends involving similar weather hazards, the *Mid-Course Assessment* grouped the weather factors cited in the NTSB reports into the following eight hazard categories, which have been used again for this year's update:

- Restricted visibility and ceiling hazards
- Precipitation (non-icing) hazards
- Icing conditions
- Turbulence and convection hazards
- Temperature and lift hazards
- En route and terminal winds

- Airborne solids hazards
- Other

The tabulation of 2002 accident reports in Appendix D lists the specific weather factors cited by the NTSB under each of these hazard categories.

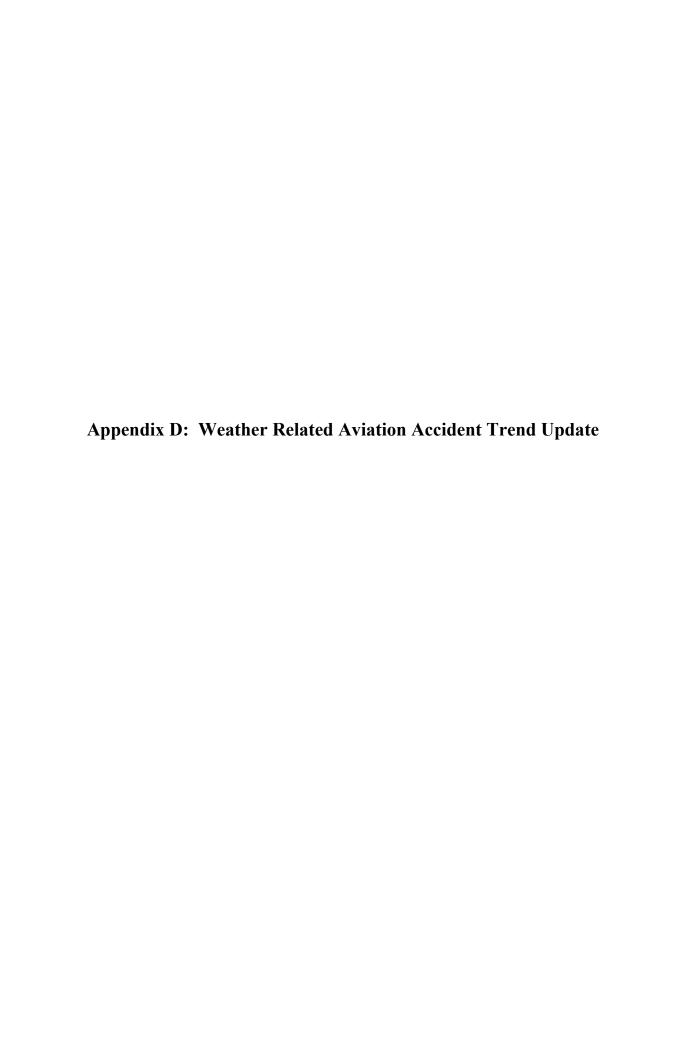


Table D-1. Part 91, General Aviation^a

	Aco	cident-Invo	olved Air	craft	Flight		cident-Inver er 100,000		
Year	All	Wx All	Fatal	Wx Fatal	Hours	All	Wx All	Fatal	Wx Fatal
1994	2,022	344	404	87	22,235,000	9.09	1.55	1.82	0.39
1995	2,056	426	413	109	24,906,000	8.26	1.71	1.66	0.44
1996	1,908	442	361	109	24,881,000	7.67	1.78	1.45	0.44
1997	1,845	383	350	87	25,591,000	7.21	1.50	1.37	0.34
1998	1,904	370	364	91	25,518,000	7.46	1.45	1.43	0.36
1999	1,906	357	340	65	29,246,000	6.52	1.22	1.16	0.22
2000	1,837	356	344	85	27,838,000	6.60	1.28	1.24	0.31
2001	1,726	280	325	38	25,431,000	6.79	1.10	1.28	0.15
2002	1,713	340	345	74	25,545,000	6.71	1.33	1.35	0.29
2003									
2004									
2005									
2006									
2006 goal							0.34		0.08
2006 (proj.)		230		26		5.84	0.80	1.16	0.08

Table D-2. Part 121, Larger Commercial Air Carriers

		Accid	dents		Departures	Accide	nts per 10	0,000 De	partures
Year	All ^b	Wx All	Fatal⁵	Wx Fatal		All	Wx All	Fatal	Wx Fatal
1994	23	6	4	0	8,238,306	0.27	0.073	0.049	0.0000
1995	36	10	3	0	8,457,465	0.43	0.118	0.035	0.0000
1996	37	11	5	0	8,228,810	0.45	0.134	0.061	0.0000
1997	49	18	4	1	10,318,383	0.47	0.174	0.039	0.0097
1998	50	9	1	0	10,979,762	0.46	0.082	0.009	0.0000
1999	51	10	2	0	11,308,762	0.45	0.088	0.018	0.0000
2000	56	16	3	0	11,457,812	0.49	0.140	0.026	0.0000
2001	45	10	6	1	10,956,003	0.37	0.091	0.018	0.0091
2002	41	8	0	0	10,138,224	0.40	0.079	0.000	0.0000
2003									
2004									
2005									
2006									
2006 goal						0.076	0.022	0.0097	0.000
2006 (proj.)						0.37	0.044	0.00	0.002

All accident statistics from NTSB. Flight hour estimates from FAA.

^a For Part 91 sector (general aviation), the data are for numbers of accident-involved aircraft, rather than numbers of accidents.

^b For 1994, includes one accident due to an illegal act. For 2001, includes 9/11/01 terrorist acts.

Table D-3. Part 135 (Scheduled and Nonscheduled)

		Accio	lents		Flight Hours	Accider	nts per 100),000 Flig	ght Hours
Year	All	Wx All	Fatal	Wx Fatal		All	Wx All	Fatal	Wx Fatal
1994	95	31	29	13	5,249,129	1.81	0.59	0.55	0.25
1995	87	25	26	11	5,113,866	1.70	0.49	0.51	0.22
1996	101	29	30	8	5,976,755	1.69	0.49	0.50	0.13
1997	98	30	20	9	4,080,764	2.40	0.74	0.49	0.22
1998	85	26	17	7	4,155,670	2.05	0.63	0.41	0.17
1999	86	25	17	5	3,546,731	2.42	0.70	0.48	0.14
2000	92	28	23	9	4,299,535	2.14	0.65	0.53	0.21
2001	79	18	20	6	3,297,432	2.40	0.55	0.61	0.18
2002	67	15	18	6	3,151,481	2.13	0.48	0.57	0.19
2003									
2004									
2005									
2006									
2006 goal						0.35	0.10	0.10	0.040
2006 (proj.)						2.52	0.51	0.65	0.211

All accident statistics from NTSB. Flight hour estimates from FAA.

All weather-related accidents — Weather-related fatal — - - Series3 — - - - Series4 2.00 1.80 1.60 Accidents per 100,00 Flight-Hours 1.40 1.20 2006 goal = 0.34 2006 projection = 0.80 1.00 0.80 0.60 0.40 2006 goal = 0.08 2006 projection = 0.08 0.20 0.00 2001 1996 1997 1998 1999 2000 2002 2003 2004 2005 2006 Year

Figure D-1. Part 91 Aviation, Weather-Related Accidents per 100,000 Flight-Hours

Figure D-2. Part 121 Aviation, Weather-related Accidents per 100,000 Departures

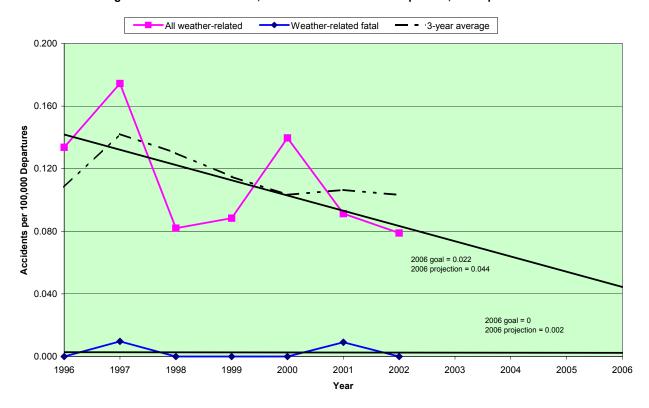


Figure D-3. Part 135 Aviation, Weather-Related Accidents per 100,000 Flight-Hours



Table D-4. Part 91 (General Aviation) Weather Factor Trend Analysis

_		Factor	Citatio	ns, All A	Acciden	ts				Factor	Citatio	ns, Fata	al Accid	ents		
Hazard Category and Factors	1995	1996	1997	1998	1999	2000	2001	2002	1995	1996	1997	1998	1999	2000	2001	2002
A. Restricted Visibility and Ceiling Hazar	ds															
Below Approach/Landing Minimums(1)	3	10	3		2	5	1	1	2	4			1	4		1
Clouds (1)	16	16	17	22	16	12	4	15	14	11		16	11	10	3	12
Fog (1)	45	37	35	29	16	25	16	16	34	30	22	22	9	15	11	12
Haze/smoke (1)	7	3	6	4	1	2	3	5	3		3	2		1	2	
Low ceiling (1)	59	45	52	41	34	36	19	27	47	34	36	33	23	27	13	22
Obscuration (1)	8	7	8	12	10	8	3	2	5	5	8	8	8	6	3	2
Whiteout (1)	2			1	1	1	3	1						1		1
Total hazard class citations	140	118	121	109	80	89	49	67	105	84	69	81	52	64	32	50
Frequency per 100,000 flight-hours	0.56	0.47	0.47	0.43	0.27	0.32	0.19	0.26	0.42	0.34	0.27	0.32	0.18	0.23	0.13	0.20
2006 goal	0.10								0.08							
2006 projection	0.01								0.00							
B. Precipitation (Non-Icing) Hazards																
Rain (1)	11	7	13	9	9	5	6	4	3	6	9	7	5	2	3	3
Snow (1)	17	11	9	6	7	17	8	6	13	8	6	5	2	9	4	2
Drizzle/mist (1)	1	4	1	3	3	3	3	2	1	2	1	2	3	2	2	2
Total hazard class citations	29	22	23	18	19	25	17	12	17	16	16	14	10	13	9	7
Frequency per 100,000 flight-hours	0.116	0.088	0.090	0.071	0.065	0.090	0.067	0.047	0.068	0.064	0.063	0.055	0.034	0.047	0.035	0.027
2006 goal	0.020								0.013							
2006 projection	0.026								0.005							
C. Icing Hazards																
Icing conditions (5)	25	18	11	9	13	9	3	14	14	11	4	5	6	4		8
Ice Fog (5)							1								1	
Freezing rain (5)	1		1	2		2	1	1	1			2		1		1
Carburetor Icing Conditions (9)	28	17	24	26	18	18	17	17	1	1	4	1		2	1	1
Total hazard class citations	54	35	36	37	31	29	22	32	16	12	8	8	6	7	2	10
Frequency per 100,000 flight-hours		0.141	0.141	0.145	0.106	0.104	0.087	0.125	0.064	0.048	0.031	0.031	0.021	0.025	0.008	0.039
2006 goal	0.036								0.011							
2006 projection	0.038								0.000							
D. Turbulence and Convection Hazards																
Turbulence (thunderstorms) (2)	1	5	3	2		1		1	1	4	2	2		1		1
Thunderstorm (2)	13	12	3	3	7	5	3	2	8	8	3	2	6	3	3	2
Thunderstorm (outflow) (2)	3	1	2				1	3	1							2
Microburst/dry (2)	1			1	1		1		0							

Table D-4. Part 91 (General Aviation) Weather Factor Trend Analysis

		Factor											al Accid			
Hazard Category and Factors	1995	1996	1997	1998	1999	2000	2001	2002	1995	1996	1997	1998	1999	2000	2001	2002
D. Turbulence and Convection Hazards	- Contin	ued														
Updraft (2)				1	1	1	1	1								
Downdraft (2)	30	22	12	16	23	21	11	19	3	2	1	1	2	1	2	1
Gusts (6)	74	105	87	75	74	51	62	77	5	9	9	7	2	3	3	7
Windshear (6)	8	9	1	6	8	9	5	7		1		2		4		
Dust devil/whirlwind (6)	3	5	2	1	9	4	6	3	1							
Variable wind (6)	6	11	5	10	9	9	12	9					1			
Sudden windshift (6)	11	6	8	12	12	6	6	5				1		1		
Mountain wave (7)	2	1	2	3	1	1		2	1	1	2	1	1			1
Turbulence (7)	13	10	7	9	13	4	3	7	4	3	4	3	4	2	1	1
Turbulence, clear air (CAT)(7)		3	1	2		1		1		1		1				1
Turbulence in clouds (7)		1	1	2	1	2				1		2	1	1		
Turbulence (terrain induced) (7)	6	5	5	6	1	5	1	3	3	3	2	4	1	1		1
Total hazard class citations	172	196	139	149	160	120	112	140	28	33	23	26	18	17	9	17
Frequency per 100,000 flight-hours	0.691	0.788	0.543	0.584	0.547	0.431	0.440	0.548	0.112	0.133	0.090	0.102	0.062	0.061	0.035	0.067
2006 goal	0.15								0.02							
2006 projection	0.29								0.00							
E. Temperatue and Lift Hazards																
Temperature Inversion (3)							1									
High density altitude (6)	25	36	33	37	48	29	15	34	3	9	10	8	9	6	2	11
Temperature, high (6)	3	4	5		1	1	1							1		
Temperature, low (6)	2				1	1		1	1							
Thermal Lift (9)		1	1				3									
No thermal lift (9)	4	4	2	4	5	2	2	3		1				1		
Total hazard class citations	34	45	41	41	55	33	22	38	4	10	10	8	9	8	2	11
Frequency per 100,000 flight-hours	0.137	0.181	0.160	0.161	0.188	0.119	0.087	0.149	0.016	0.040	0.039	0.031	0.031	0.029	0.008	0.043
2006 goal	0.032								0.006							
2006 projection	0.104								0.029							
F. En Route and Terminal Winds																
Unfavorable wind (3)	20	14	17	7	6	7	1	6	2	2	1					
Crosswind (6)	90	123	111	87	78	80	77	71	5	7		1	1			2
Tailwind (6)	50	36	36	46	46	52	41	45	6	7	2	6	2	7	3	5
High wind (6)	18	36	17	19	12	14	20	12	2	7	5	2	1	3	2	3
Total hazard class citations	178	209	181	159	142	153	139	134	15	23	8	9	4	10	5	10
Frequency per 100,000 flight-hours	0.71	0.84	0.71	0.62	0.49	0.55	0.55	0.52	0.060	0.092	0.031	0.035	0.014	0.036	0.020	0.039
2006 goal	0.16								0.045							
2000 goal	0.10								0.015							

Table D-4. Part 91 (General Aviation) Weather Factor Trend Analysis

		Factor	Citatio	ns, All A	Acciden	ts				Factor	Citation	ns, Fata	al Accid	ents		
Hazard Category and Factors	1995	1996	1997	1998	1999	2000	2001	2002	1995	1996	1997	1998	1999	2000	2001	2002
G. Electrical Hazards																
Lightning (2)	1				1	1			1				1	1		
Static Discharge (9)		1								1						
Total hazard class citations	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0
Frequency per 100,000 flight-hours	0.0040	0.004	0.000	0.000	0.003	0.004	0.000	0.000	0.0040	0.004	0.000	0.000	0.003	0.004	0.000	0.000
2006 goal	0.0008								0.0008							
2006 projection	0.0000								0.0000							
H. Airborne Solids Hazards																
Sand/dust storm (1)	1								1							
Hail (2)		2			1					1			1			
Total hazard class citations	1	2	0	0	1	0	0	0	1	1	0	0	1	0	0	0
Frequency per 100,000 flight-hours	0.004	0.008	0.000	0.000	0.003	0.000	0.000	0.000	0.004	0.004	0.000	0.000	0.003	0.000	0.000	0.000
2006 goal	0.001								0.001							
2006 projection	0.000								0.000							
I. Other																
Other								4								0
Total hazard class citations	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0
Frequency per 100,000 flight-hours	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.016	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Figure D-4. Part 91, Trend for Category A, Restricted Visibility and Ceiling Hazards

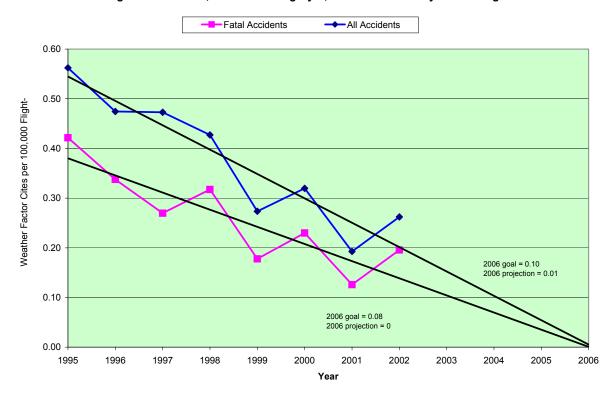


Figure D-5. Part 91, Trend for Category B, Precipitation (Non-Icing) Hazards

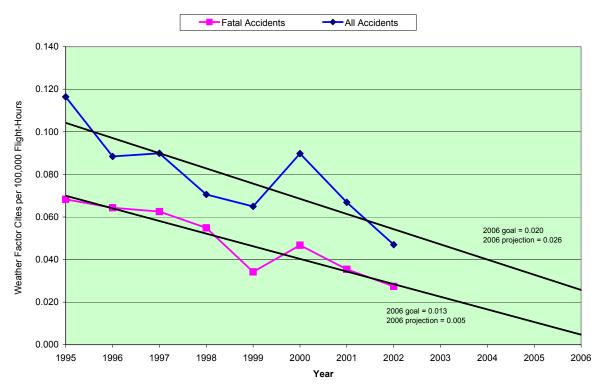


Figure D-6. Part 91, Trend for Category C, Icing Hazards

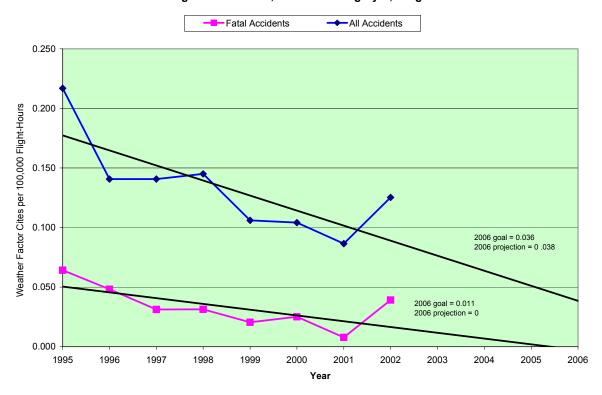


Figure D-7. Part 91, Trend for Category D, Turbulence and Convection Hazards

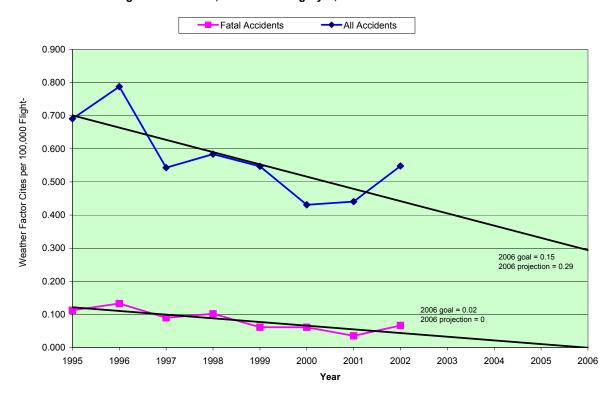


Figure D-8. Part 91, Trend for Category E, Temperature and Lift Hazards

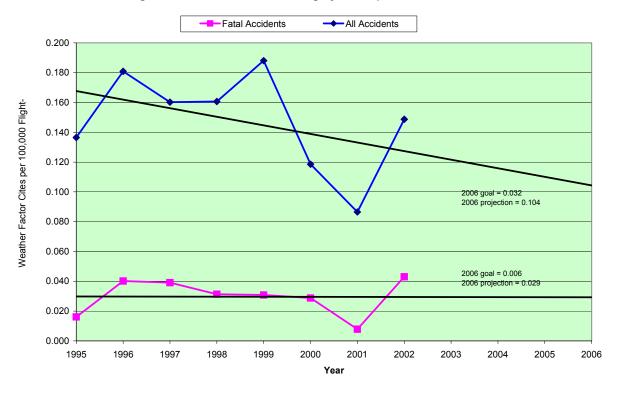


Figure D-9. Part 91, Trend for Category F, En Route and Terminal Winds

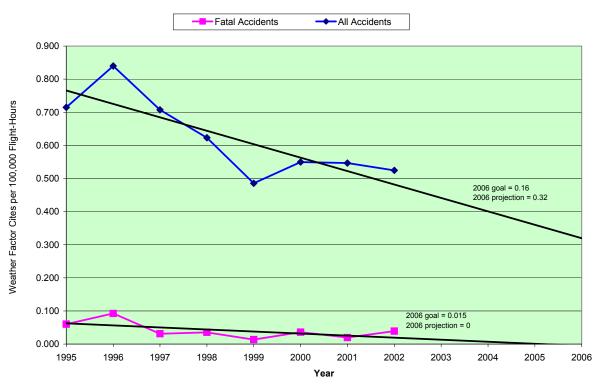


Table D-5. Part 121 Weather Factor Trend Analysis

		Factor	Citations	s, All Ac	cidents					Factor	Citations	s, Fatal A	Accident	3		
	1995	1996	1997	1998	1999	2000	2001	2002	1995	1996	1997	1998	1999	2000	2001	2002
All Factors	11	13	20	10	10	16	10	9	0	0	1	0	0	0	1	0
Frequency per 100,000 departures	0.130	0.158	0.194	0.091	0.088	0.140	0.091	0.089	0.000	0.000	0.010	0.000	0.000	0.000	0.009	0.000
2006 goal	0.029								0.0000							
2006 projection	0.052															
A. Restricted Visibility and Ceiling Ha	zards															
Fog (1)		1														
Low ceiling (1)							1									
Whiteout (1)			1													
Total hazard class citations	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0
B. Precipitation (Non-Icing) Hazards																
Rain (1)		1	1					1								
Snow (1)			1					1								
Drizzle/mist (1)				1												
Total hazard class citations	0	1	2	1	0	0	0	2	0	0	0	0	0	0	0	0
C. Icing Hazards																
Icing conditions (5)			1													
Total hazard class citations	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
D. Turbulence and Convection Hazard	s															
Turbulence (thunderstorms) (2)		1	1	3			2	1								
Thunderstorm								1								
Turbulence, convection induced (2)						1	1	1								
Gusts (6)						1		1								
Windshear (6)	1					1										
Mountain wave (7)						1										
Turbulence (7)	5	1	3	1	5	6	3	1								

Table D-5. Part 121 Weather Factor Trend Analysis

		3 7 7 2 3 2 1 1 1 1 2 1 1 3 2 1 10 9 13 7 9 15 8 7 0 0 1 0 0 0 0 0.118 0.109 0.126 0.064 0.080 0.131 0.073 0.069 0.000 0.000 0.010 0.000 0.000 0.000 0.000														
	1995	1996	1997	1998	1999	2000	2001	2002	1995	1996	1997	1998	1999	2000	2001	2002
D. Turbulence and Convection Hazards																
Turbulence, clear air (CAT)	3	7	7	2	3	2		1			1					
Turbulence in clouds	1		2	1	1	3	2	1								
Total hazard class citations	10	9	13	7	9	15	8	7	0	0	1	0	0	0	0	0
Frequency per 100,000 departures	0.118	0.109	0.126	0.064	0.080	0.131	0.073	0.069	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000
2006 goal	0.023								0.000							
2006 projection	0.052															
E. Temperature and Lift Hazards																
Temperature, high (6)		1					1								1	
Total hazard class citations	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0
F. En Route and Terminal Winds																
Unfavorable wind	1			1												
Crosswind		1	2			1										
Total hazard class citations	1	1	2	1	0	1	0	0	0	0	0	0	0	0	0	0
H. Airborne Solids Hazards																
Hail (2)				1												
Total hazard class citations	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
I. Other			1		1											
Total hazard class citations	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0

Table D-6. Part 135 Weather Factor Trend Analysis

		Factor	Citatio	ns, All	Accid	ents					Factor	Citatio	ons, Al	Accid	ents	
_	1995	1996	1997	1998	1999	2000	2001	2002	1995	1996	1997	1998	1999	2000	2001	2002
A. Restricted Visibility and Ceiling Hazards																
Below Approach/Landing Minimums(1)							1									
Clouds (1)	2	1	3	2		2	2		2	1	3	2		1	1	
Fog (1)	5	9	6	3	1	3	1	2	3	2	2	2	1	2		1
Low ceiling (1)	7	10	9	6	5	7	3	3	6	5	4	1	2	5	3	3
Obscuration (1)	2	2	2					2	2	1						1
Whiteout (1)	1	3	2	3	4	3	1	1			1		1	1	1	
Total hazard class citations	17	25	22	14	10	15	8	8	13	9	10	5	4	9	5	5
Frequency per 100,000 flight-hours	0.33	0.42	0.54	0.34	0.28	0.35	0.24	0.25	0.25	0.15	0.25	0.12	0.11	0.21	0.15	0.16
2006 goal	0.075								0.04							
2006 projection	0.16								0.11							
B. Precipitation (Non-Icing) Hazards																
Rain (1)	2		1	2		1	2		1			1		1		
Snow (1)	2	2	2	2	3	4	1	3	1			2	1	1	1	C
Drizzle/mist (1)	1	1						1		1						1
Total hazard class citations	5	3	3	4	3	5	3	4	2	1	0	3	1	2	1	1
Frequency per 100,000 flight-hours	0.10	0.05	0.07	0.10	0.08	0.12	0.09	0.13	0.04	0.02	0.00	0.07	0.03	0.05	0.03	0.03
2006 goal	0.015								0.006							
2006 projection	0.14								0.04							
C. Icing Hazards																
Icing conditions (5)	4	3	4	4	3	3	2	4	1	1	2	2	1	2	2	1
Freezing rain (5)	1				1	1		1								1
Carburetor Icing Conditions (9)			1			2										
Total hazard class citations	5	3	5	4	4	6	2	5	1	1	2	2	1	2	2	2
Frequency per 100,000 flight-hours	0.10	0.05	0.12	0.10	0.11	0.14	0.06	0.16	0.02	0.02	0.05	0.05	0.03	0.05	0.06	0.06
2006 goal	0.015								0.004							
2006 projection	0.15								0.09							

Table D-6. Part 135 Weather Factor Trend Analysis

		Factor	Citatio	ns, All	Accid	ents					Factor	Citati	ons, Al	I Accid	lents	
	1995	1996	1997	1998	1999	2000	2001	2002	1995	1996	1997	1998	1999	2000	2001	2002
D. Turbulence and Convection Hazards																
Turbulence (thunderstorms) (2)						1								1		
Thunderstorm (2)				1												
Downdraft (2)	2	1	5	2	3			1	1		1					
Gusts (6)	4	3	2	3	2		2	1		1						
Windshear								1								1
Variable wind (6)	1	1					1									
Turbulence (7)					1	1	1									
Turbulence in clouds (7)	1								1							
Turbulence (terrain induced) (7)	1		2			1	1		1		1					
Total hazard class citations	9	5	9	6	6	3	5	3	3	1	2	0	0	1	0	1
Frequency per 100,000 flight-hours	0.18	0.08	0.22	0.14	0.17	0.07	0.15	0.10	0.06	0.02	0.05	0.00	0.00	0.02	0.00	0.03
2006 goal	0.026								0.008							
2006 projection	0.08								0.00							
E. Temperatue and Lift Hazards																
High density altitude (6)	1		2	3	1	3			1				1			
Temperature, low (6)				1								1				
Total hazard class citations	1	0	2	4	1	3	0	0	1	0	0	1	1	0	0	0
Frequency per 100,000 flight-hours	0.02	0.00	0.05	0.10	0.03	0.07	0.00	0.00	0.02	0.00	0.00	0.02	0.03	0.00	0.00	0.00
2006 goal	0.002								0.002							
2006 projection	0.02								0.00							
F. En Route and Terminal Winds																
Unfavorable wind (3)	1	1	1		1	2										
Crosswind (6)		5	4	5	1	3	3	1								1
High wind (6)	2	1	2	1	1		1	1	1	1	1	1				1
Tailwind (6)		4	4	3	4	2	1	4		1						
Total hazard class citations	3	11	11	9	7	7	5	6	1	2	1	1	0	0	0	2

Table D-6. Part 135 Weather Factor Trend Analysis

		Factor	Citatio	ns, All	Accid	ents					Facto	r Citatio	ons, Al	I Accid	lents	
	1995	1996	1997	1998	1999	2000	2001	2002	1995	1996	1997	1998	1999	2000	2001	2002
F. En Route and Terminal Winds-Continu	ed															
Frequency per 100,000 flight-hours	0.06	0.18	0.27	0.22	0.20	0.16	0.15	0.19	0.02	0.03	0.02	0.02	0.00	0.00	0.00	0.06
2006 goal	0.024								0.005							
2006 projection	0.22								0.024							
G. Electrical Hazards																
Lightning (2)	1															
Total hazard class citations	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Frequency per 100,000 flight-hours	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2006 goal	0.002								0.000							
2006 projection	0.00								0.000							

Figure D-10. Part 121, All Weather Hazards Versus Turbulence and Convection Hazards

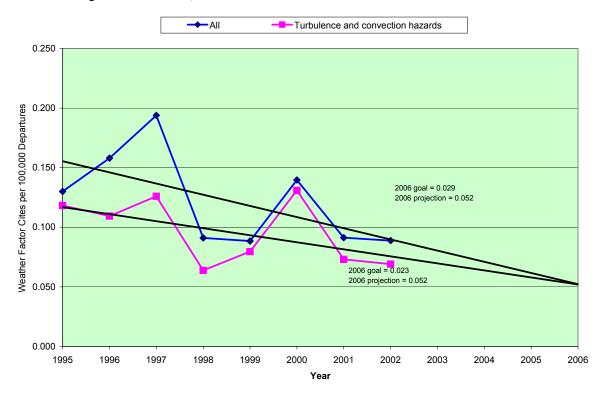


Figure D-11. Part 135, Trend for Category A, Restricted Visibility and Ceiling Hazards

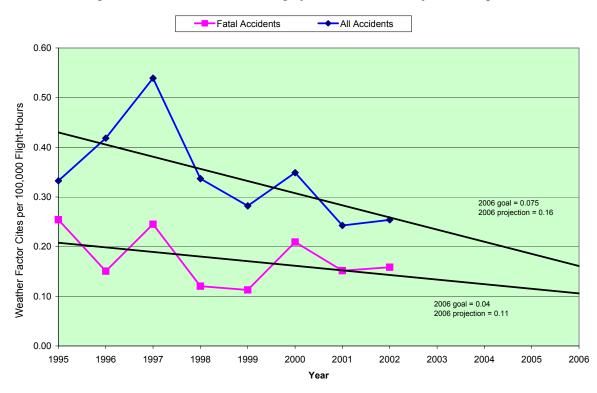


Figure D-12. Part 135, Trend for Category B, Precipitation (Non-Icing) Hazards

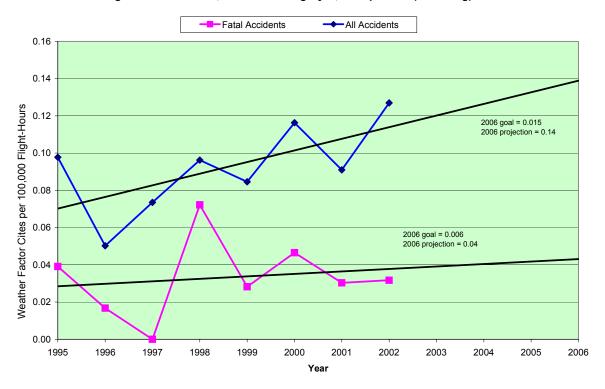


Figure D-13. Part 135, Trend for Category C, Icing Hazards



Figure D-14. Part 135, Trend for Category D, Turbulence & Convection Hazards

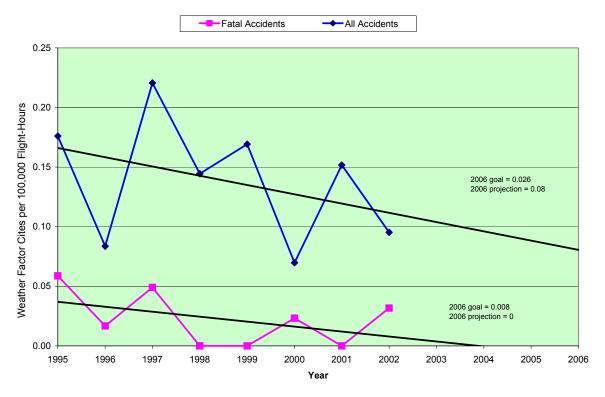
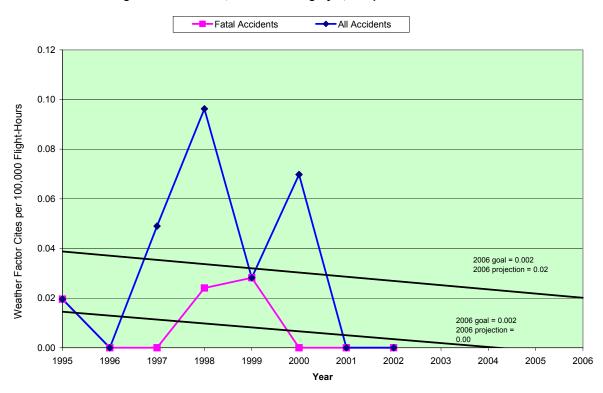


Figure D-15. Part 135, Trend for Category E, Temperature and Lift Hazards



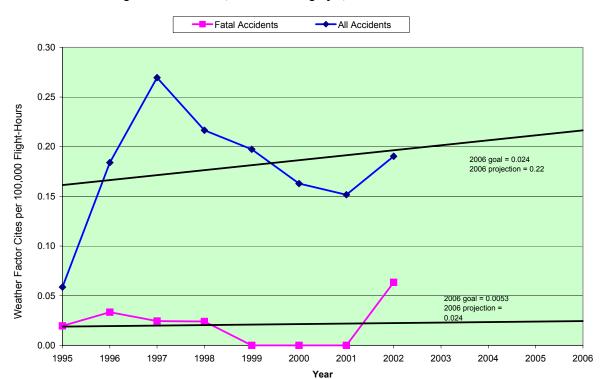


Figure D-16. Part 135, Trend for Category F, En Route and Terminal Winds